15 EASY STEPS TO COVER A FOAM MODEL p. 87

APRIL 2005

MODEL Airplane NEWS

BUMP LOOP & ROLL
PRO TIPS FOR AEROBATIC SUCCESS

YOUR FIRST TURBINE JET
EASY TO BUILD
EASY TO FLY

HOW TO
ADD CUSTOM WHEEL PANTS

+

TONS OF TORQUE
FUJI'S GAS 4-STROKE
p. 110

CARL GOLDBERG
PITTS MONSTER ARF

5 IN-DEPTH REVIEWS
- Carl Goldberg Products **Pitts Monster ARF**
- Dave Patrick Models **Super Cub** » Hangar 9 **Miss America**
- The World Models **Fun World EP** » Pacific Aeromodel **Edge 540T**

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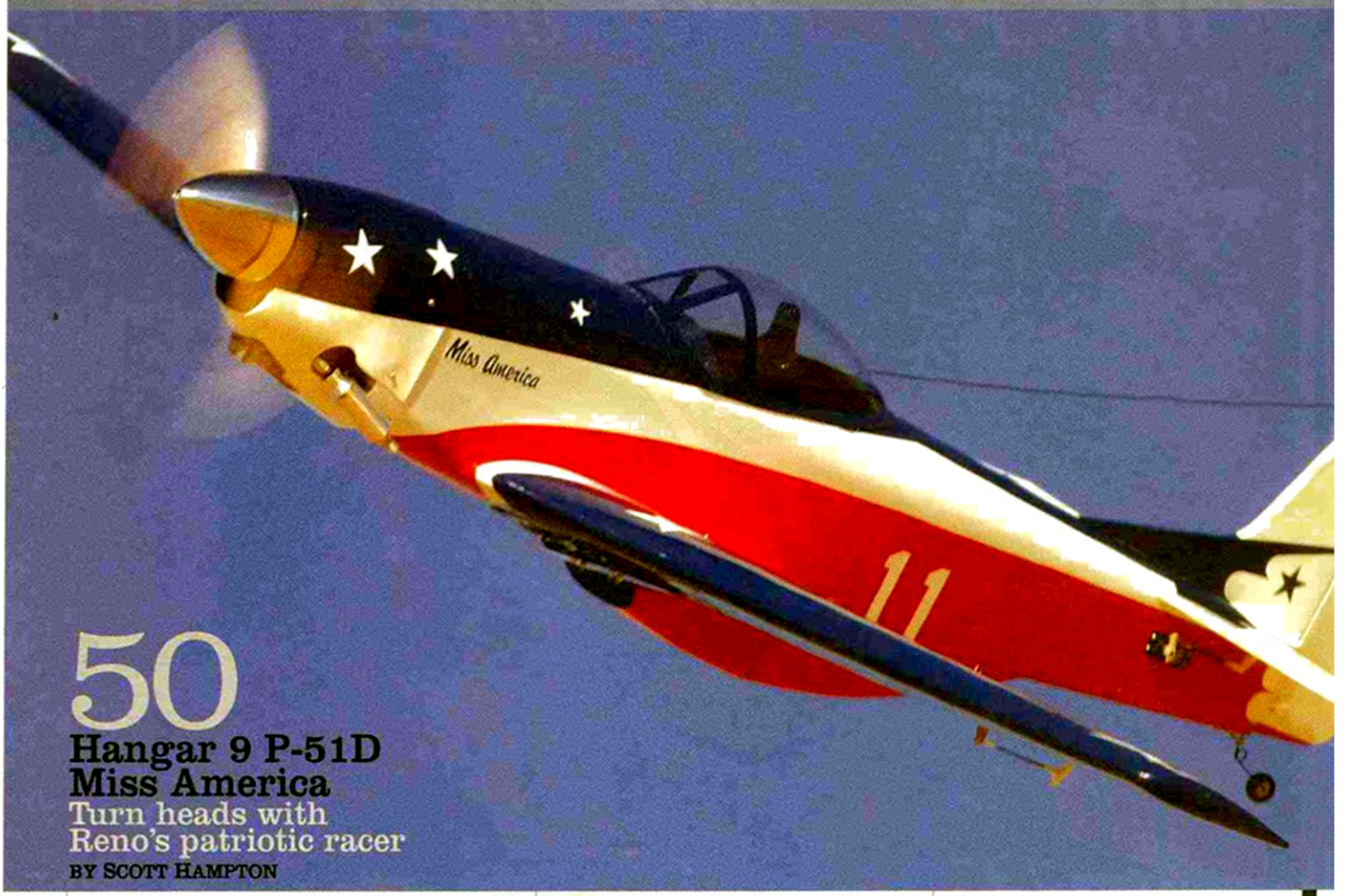

50 Hangar 9 P-51D Miss America

Turn heads with Reno's patriotic racer

BY SCOTT HAMPTON

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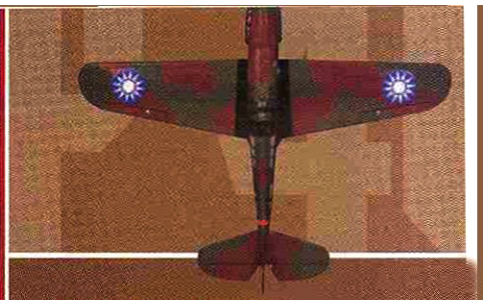
ON THIS PAGE: Scott Hampton reviews Hangar 9's P-51D Miss America (page 50; photo by John Reid).

P-40E WARHAWK



COMBINING REMARKABLE WARBIRD DETAIL...

Put yourself right into the middle of war-torn Asian skies. Hangar 9's P-40E Warhawk 60 ARF is a startlingly accurate scale rendition of an actual Flying Tiger that battled the Japanese during World War II. Finely constructed from lightweight balsa and ply and covered in authentic Hangar 9® UltraCote®, the P-40E features a prepainted fiberglass cowl and belly pan, adding to the model's authentic scale appearance. The famous Flying Tiger "shark's mouth" logo is factory-painted to match the original plane.

...WITH SENSATIONAL SPORT MODEL PERFORMANCE

The P-40E is a nimble sport model, thanks in part to its lightweight construction and engineering, which ensures maneuverability and superb aerobatic performance. It's extremely stable and flies very well at all speeds. It's built to operate with a wide variety of engines; with a Saito™ FA-100, vertical performance is excellent and huge loops are a breeze. Hangar 9's heavy-duty metal-constructed 90° rotating retracts come factory-installed to ensure solid landings.

HAN2425

Length:	52 in
Wingspan:	64.6 in
Weight:	7.5-8.5 lb
Wing Area:	709.4 sq in
Radio:	5 channels w/6 servos
Engine:	.60-.78 2-stroke .91-1.00 4-stroke

HANGAR 9®

Rely on Hangar 9's durable metal-constructed 90° retracts, which come factory-installed.

The P-40E Warhawk is based on Rudy Frasca's full-size P-40E, which has been seen in numerous Hollywood productions, including the Steven Spielberg film 1941.

GET READY FOR SPRING!

WELCOME TO OUR APRIL ISSUE—officially, our first "spring" magazine of 2005. The new flying season is shaping up to be a good one, with even more high-quality planes, engines and gear. This month, we have five exciting pilot reports, from the Monster Pitts on our cover to an incredibly scale Cub and a fun-fly aerobat. We also have a first look at Fuji's brand-new 4-stroke gasoline engine and, as always, the latest planes and gear in "Air Scoop."

Whether you're a veteran pilot or a sport flier who's just learning the basics of aerobatics, you'll find a new move to practice in our "ABCs of Humpty Bumps." As pro pilot and author Dave Patrick notes, "The Humpty Bump probably has more variations than any other maneuver I can think of. In fact, the variations are practically limitless!" In his feature article, Dave details the basic Humpty Bump and adds even more spice with trickier add-ons and modifications. His illustrated article begins on page 68.

In the workshop this month, our experts offer two ways to dress up your plane. First, master modeler Faye Stilley shares his technique for building custom wheel pants. His basic method uses all-balsa construction, so the resulting wheel pants are lightweight and won't break the bank. At the other end of the construction material spectrum, associate editor Rick Bell details how he covered a foam park flyer with a smooth film finish that not only eliminates the molded-foam pinholes but also offers extra strength and rigidity.

There's no denying that turbine-powered jets are among the coolest planes in RC: they're sleek and fast, and they sound amazing. But that level of sophistication has always carried a hefty price tag—until now. Designed by Dick Sarpolus, the Discovery Jet is intended as a "first jet," so it has pilot-friendly flight characteristics and, although it flies more slowly than other jet models, it's capable of basic aerobatics. This straightforward build also features a foam-core wing and tail and a basic wooden fuselage, and it's powered by a reasonably priced turbine engine. If you've ever dreamt of owning and flying a turbine-powered jet, now's your chance! See page 100 for details.

I hope you'll continue to write to us at *Model Airplane News*; your feedback helps us supply the information you need to ensure your RC success. Send your email to modelairplanenews@airage.com, or write to us at 100 East Ridge, Ridgefield, CT 06877-4606 USA. We look forward to hearing from you!

Safe landings.

Debra Cleghorn

Executive Editor

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Est. 1929

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"...I've been a subscriber for six years, and I learn something new every month."

FLIGHT OF THE PHOENIX

I just flipped through the March 2005 issue, and after getting a behind-the-scenes preview in "Final Approach," I'm definitely taking my family to see "Flight of the Phoenix" this weekend. I loved this film when it came out in '65, and I can't wait to introduce my kids to the new version. Thanks!

RANDALL WHITACRE
KANSAS CITY, KS

Randall, we're glad you thought the story and those photos were as cool as we did! We all enjoyed the movie, too. DC

ENGINE INSTALLATION

I've been a subscriber to *Model Airplane News* for six years, and I learn something new every month. In the March 2005 issue, I really enjoyed "Engine Tech: Your Guide to Engine Installations." I've wanted to use something different from the one-piece, molded-plastic jobs that come with the ARFs I've bought, and on reading that article, I learned that now I have many other options to choose from. I was also impressed by the article on the Don Lowe Masters. I'll never be able to afford a giant-scale aerobatic plane like the ones in the photos (let alone have the skills to pilot it!), but I was blown away by the photography. As I went through the pages, I could almost imagine that I was there and watching these great pilots in action. Articles like these are why I'll make sure that my subscription never runs out! Thank you, and please keep more issues like this one coming.

BILL LANGLEY [EMAIL]

We appreciate the feedback, Bill. We always enjoy hearing from readers and, in fact, the engine-installation feature you liked so much was inspired by a question from a reader. Those photos from the Don Lowe Masters were shot by our West Coast associate editor John Reid—a master lensman if there ever was one! DC

MOTOR SELECTION

In the February '05 review of the Hangar 9 Twist, Rick Bell used an Axi 4120/14 motor. I had been looking at the 4130/20; it looks as if it has approximately twice the wattage (at only a little over 3 ounces extra weight) with the recommended prop. I noticed that you used a larger prop than was recommended. I'm new to brushless electrics and hope that you can offer more info on this. I bought the Twist to test the waters with a brushless motor and really appreciate help from experts like you.

RAY LOCKHART [EMAIL]

Ray, I chose the Axi 4120/14 instead of the 4130/20 for several reasons. First, I wanted to keep the weight of the Twist as low as possible; as you mentioned, the 4130/20 is 3 ounces heavier. Second, if you look at the motor specs, you'll see that the 4120/14 is designed to handle from 12 to 16 cells (14.4 to 19.2 volts) versus the 4130/20's rating of 20 to 30 cells (24 to 36 volts). This means that if you use the 4130/20, right off the bat, you'll need to use more batteries, which again means more weight. At a minimum, a 7S (25.9V) Li-poly battery would be needed instead of the 4S (14.8 volts) that the 4120/14 requires. Also, a 15-inch-diameter prop is the largest the Twist can handle without resorting to taller landing gear or larger wheels; the 4130/20 requires a 16-inch (or larger) prop. My setup with the 15x8 prop produces more than 850 watts and 62 amps, so the Twist has almost unlimited vertical at takeoff and a flight duration of more than 15 minutes before the power starts to sag. For the Twist, the smaller motor is a winning combination. RB

DESIGN SECRETS

I just wanted to write and say thanks for your series on CAD. I love Gerry Yarrish's "Thinking Big" column, as I enjoy building and flying IMAA-size models, and your discussion on wing and fuselage development was the icing on the cake. I have always wanted to take on a scratch-built project that started with just pencil and paper. Now that I have ModelCAD, I don't need a pencil, but I am going to develop a simple sport design that will be easy to build. Thanks again for inspiring me.

KEITH UNDERHILL
MOUNTAIN VIEW, CA

Keith, thanks for writing. I really think that CAD is a great tool for modelers because it opens up a whole new world of design freedom. A simple sport design is a good place to start. Just remember to let the CAD tools do all the work, don't over-think the design, and stick with a design type that's familiar to you. Good luck, and when you've finished building, please send us a photo; I'd love to see it in our "Pilot Projects" section! GY

WRITE TO US! WE WELCOME YOUR COMMENTS AND SUGGESTIONS. LETTERS SHOULD BE ADDRESSED TO "AIRWAVES," *MODEL AIRPLANE NEWS*, 100 EAST RIDGE, RIDGEFIELD, CT 06877-4606 USA; EMAIL MAN@AIRAGE.COM. LETTERS MAY BE EDITED FOR CLARITY AND BREVITY. WE REGRET THAT, OWING TO THE TREMENDOUS NUMBERS OF LETTERS WE RECEIVE, WE CANNOT RESPOND TO EVERY ONE.

<Top Flite P-40E

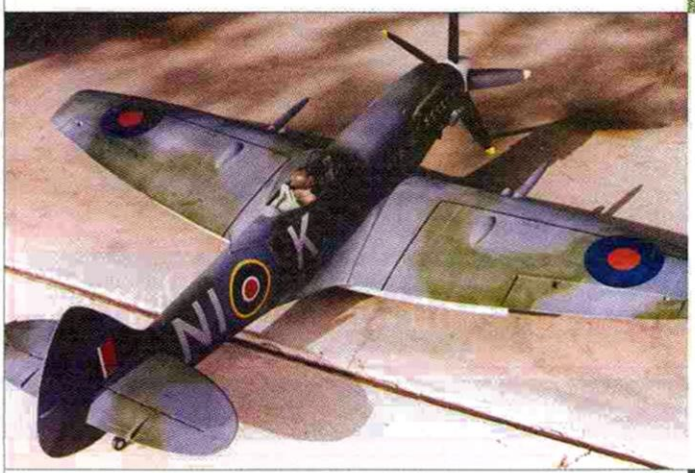
Barry R. McLean
Whittier, CA

This pilot's project came all the way from sunny California. Barry modified his Top Flite kit by hinging the rudder and elevator to simulate the full-size P-40E, changing the model's markings, installing Century Jet rotating retracts in the wings and covering the model with Coverite and 21st Century spray paint. This P-40E also sports a fully detailed and handcrafted cockpit. Barry powers his gorgeous model with an O.S. FS 1.20 engine and Futaba radio gear. How does it fly? He tells us, "If you have ever seen the movie 'Flying Tigers' with John Wayne ... that is how it flies!"

>Sig King Kobra

Brian Bills
Salt Lake City, UT

Brian calls this intimidating model the "Screaming Dragon"—how appropriate! His 7-pound, 58-inch-span model took almost a year to build. To achieve that incredible-looking finish, Brian used MonoKote Metallic Charcoal, Pearl Red and Pear Yellow. He also hand-cut every detail from scale to tail and used an estimated 1,000 pieces of MonoKote! Brian powers his King Kobra with an MDS .68 engine, a 12x6 propeller and an Airtronics VG6000 radio, and he says, "It flies as good as it looks."



<Spitfire

Tony Kameen
Moreno Valley, CA

Check out this model! Tony has really outdone himself with this Spitfire. Not only has he modified the tail feathers to scale airfoils, but he also added a retractable tailwheel, detailed bubble-hood canopy, flaps, operational navigation lights, removable cannon and a 5-blade scale prop. Tony has even installed a camera to record his flights! He gets this baby off the ground using an O.S. .61 FX engine and an Airtronics Radiant 6 radio. He also installed Rhom-Air retracts and Robart struts. The incredible finish is the result of silkspan primed with auto acrylic lacquer primer. He also used Testors Model Master spray can colors sealed with the new Klass Kote two-part epoxy. Last, the markings are home-generated designs printed on Micro-Mark decal stock.

>Sterling Fokker D-VII

Kenneth G. Mann
Grand Isle, VT

After crashing his Fokker D-VII in 1982, Kenneth recently decided to resurrect its mangled fuselage and tail and to build a pair of Fokker D-VII wings featured in a Nick Ziroli article. These new wings give his Fokker better and slower flying characteristics. Kenneth achieved its great finish with Coverite lozenge camouflage. He powers his model with an O.S. .91 4-stroke engine and a 14x6 Windsor propeller with a Perry oscillating pump. Other features include Williams Bros. machine-gun replicas and Joseph Nieto cockpit details. Kenneth explains, "Adding downtrim and decreasing the incidence of the upper wing by 1.5 degrees created a slow-flying, highly aerobatic plane."

Caudron G3 Bipe

Mario Aldo Mastice
Neuquen, Argentina

This 7-pound, 81-inch-span Caudron was built to commemorate the first airplane flown in Mario's home city of Neuquen in Patagonia, Argentina. He build the model out of wood and gave it scale details such as a dummy engine, a cowl and a cockpit. He powers his biplane with an O.S. .40 LA engine, a Futaba T6XAS radio, 2 S3003 standard servos and 3 microservos. Mario says that his little Caudron "... flies like a trainer."

Great Planes Super Skybolt

Randall Stamper
Littleton, CO

Gentlemen, start your engines! Randall, a NASCAR junkie, couldn't decide how to cover his Super Skybolt. After Dale Earnhardt's death at Daytona, Randall decided to dedicate his Skybolt to Dale's "Intimidator." Decked out in black and aluminum MonoKote and 1/10-scale RC car decals, this Skybolt surely looks as though it rips through the sky. Randall powers his model with an O.S. 1.20 4-stroke engine, so keep your eyes peeled or you might miss this fast flyer.

Great Planes Extra 330L

Charles Vettes
Rancho Cucamonga, CA

This is not just another pretty face! Charles's Extra 330L is quite the performer as well. He spent four months perfecting his 26-pound aerobatic beauty. Covered in UltraCote and Du Pont Nason automotive paint, this head-turner is powered by a 3W-100 motor turning a 27x10 propeller, a Hitec receiver, a 5-cell, 3000mAh battery pack, 8 JR 8411 servos and a Futaba 9-channel radio. Charles even used a servo isolator for safety purposes. He tells us, "The plane flies great ... it's my first model that can do knife-edge loops without any trouble."

Bell XFM-1 Airacuda

Dick Eimert
Airmont, NY

As you can see, this Bell XFM-1 is an incredible replica of the 1940s original. From what started as doodles in his school notebook, Dick was able to create a 1/10-scale model. Not many people may remember the Bell XFM-1 because its poor flight performance and constant need for maintenance made its existence brief and, consequently, an infrequent modeling subject. After he had received a 3-view drawing from the Air Force Museum, Dick was ready to build. With a wingspan of 84 inches, this Airacuda was quite a challenge. Since the craft requires that the inverted O.S. FS .52 4-stroke engines be perfectly balanced with the center of gravity, Dick designed the engine drive system before he constructed the airframe. The Airacuda's interior is made of hollow, 1/2-inch sheets of balsa, and that makes the craft very light and strong. Its covering is 21st Century aluminum fabric, and its landing gear is an XFM-1A tricycle configuration. This sounds like a lot of work, but he didn't stop there! Dick also custom-made his nacelles out of molded fiberglass, and he used windshield material to form all of the Airacuda's glass surfaces. Beautiful job, Dick.

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Illustrations by Richard Thompson

brush off

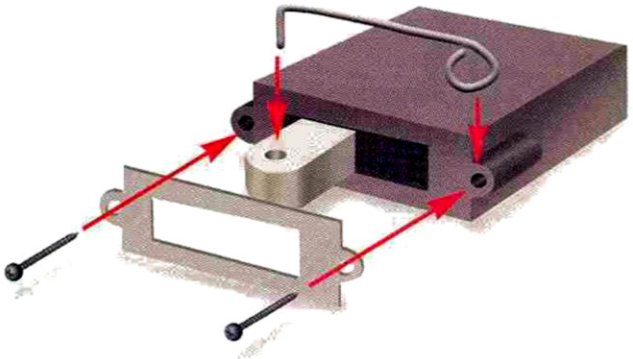
Our computer transmitters have a lot of nooks and crannies on them, and these are great places for dust, dirt and grime to accumulate. After a while, the transmitter can look pretty dirty. An easy way to keep that expensive piece of equipment looking new without resorting to harsh cleaners is to use a small, stiff-bristled paintbrush to remove the dust and dirt. A brush that's 1½ inches wide works well on large areas, and an acid brush works great for getting into tight corners.

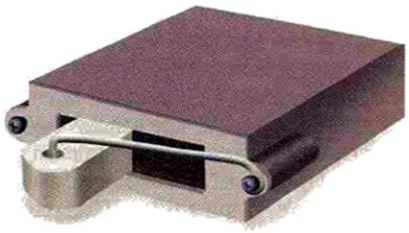
Rodney Roy, New Britain, CT

all dressed up

Here's a neat and inexpensive way to enhance the scale look of any pilot. Glue a small length of a rubber band around the back of the helmet to each end of the goggles to simulate a goggle strap. A larger no. 64 rubber band glued on top of the shoulder harness adds thickness to it and gives it more dimension. You can paint the rubber band, but sometimes the tan color of the rubber band is fine as is.

Pete Noell, Langhorne, PA





turned on

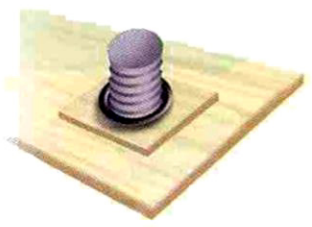
Has this ever happened to you? You arrive at your favorite flying site and when you unload your stuff, you realize that the receiver switch somehow got turned on and your battery has been discharged. To prevent this, you can form a simple safety clip from a small length of wire. Bend it as shown and drill a small hole in the switch lever. Use one of the mounting screws to attach the clip to the model and to the switch. When you insert the clip in the switch, the lever can't move. Just remember to remove the clip and place it in your field box before flying.

Senji Watanabe, Jyonanku, Japan

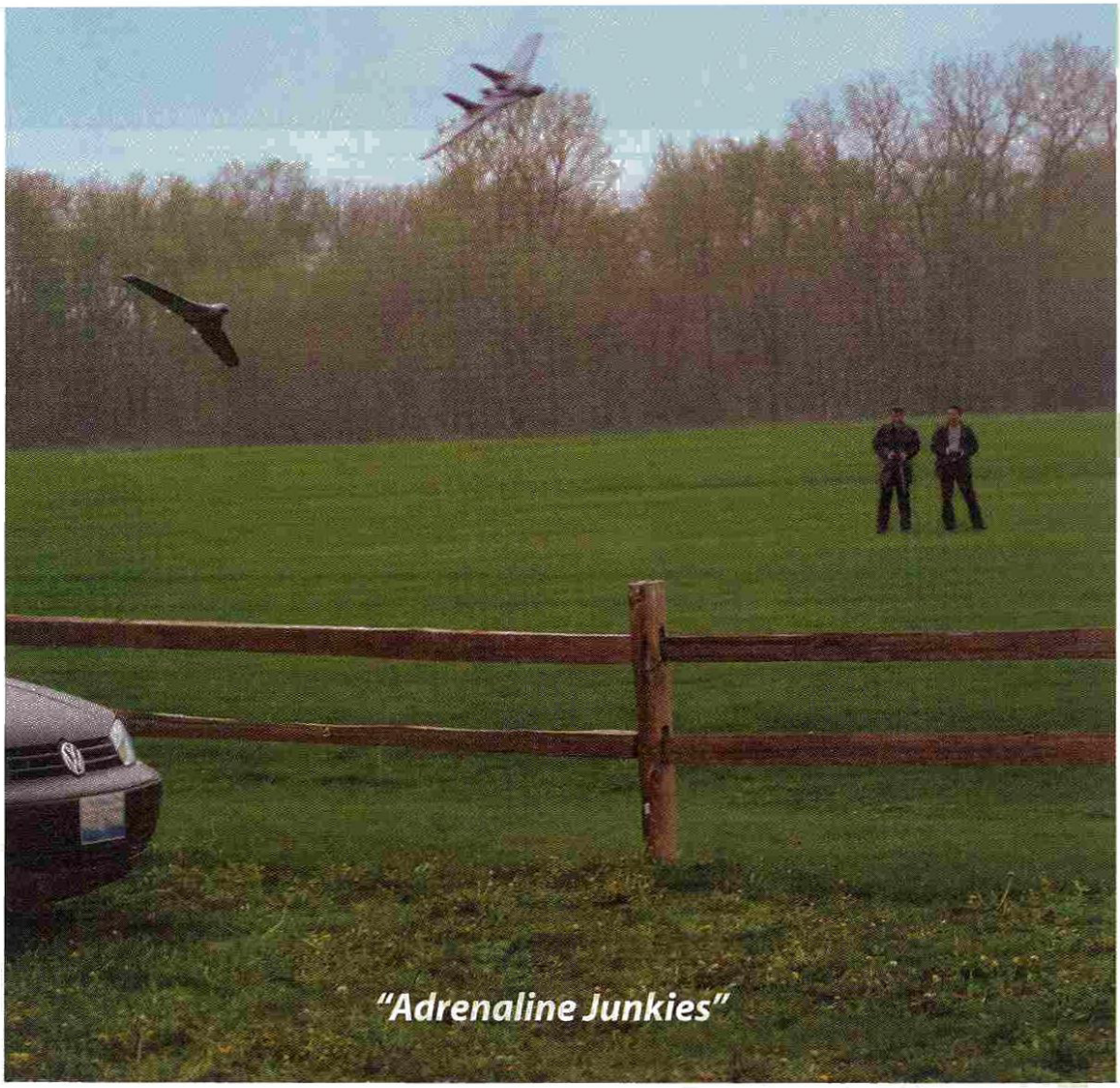
hold on there

Wing bolts can fall out during transportation or disappear at the field. An easy way to secure the bolts is to slide a small rubber O-ring around the bolts after you insert them through the wing. The O-rings will hold the wing bolts, but you can remove them easily if needed.

Gary Ritchie, Olympia, WA



SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH ITEM YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.



You roll inverted, pull hard on the stick and head for the deck. You blast out the bottom of the split-S, slashing and weaving just a few feet above the grass with a bandit hot on your tail. You're not thinking about work. You're not thinking about bills. All that matters is turning the tables on your buddy and making him run for a while. This is the kind of high-energy, aerobatic action that awaits you with ParkZone's Charge-and-Fly™ F-27 Stryker.™

The ParkZone™ F-27 Stryker comes with everything needed to get flying in one box—even the transmitter batteries. In fact, you could pick up a Stryker after work, charge the battery on the drive to the park, spend about five minutes of final assembly and be flying before anyone noticed your cubicle was empty.

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PKZ1200

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HANGAR 9
P-40E WARHAWK

Hangar 9's .60-size ARF P-40E is an accurate scale rendition of an actual Flying Tiger aircraft used during WW II, but its realistic scale looks don't hinder its outstanding sport flight performance. With lightweight balsa-and-ply construction, this ARF also comes with a high-quality, painted fiberglass cowl and a belly pan. The plane is expertly covered in Hangar 9 UltraCote. Durable, installed metal retracts rotate 90 degrees into the wing. Specifications: wingspan—64.6 in.; wing area—709 sq. in.; length—52 in.; weight—7.5 to 8.5 lb. We can't wait to get our hands on this one!

Hangar 9; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

WATTAGE
CHARGE-IT-ALL SPORT

Now you can have a charger that can charge any battery at the field or on the workbench. The new Charge-It-All Sport from WattAge can charge Ni-Cd, NiMH and Li-poly batteries from an AC or DC input. This versatile charger has six selectable output amperage settings for Ni-Cds and NiMHs ranging from 1 to 6 amps and auto selection for Li-poly batteries ranging from 0.1 to 2 amps. We know you're wondering, "Sure; but how much will all of this versatility cost?" You're in for a pleasant surprise: the Charge-It-All Sport costs only $70!

WattAge; distributed by Global Hobby Distributors (714) 963-0329; watt-age.globalhobby.com.

NORTHEAST SAILPLANE PRODUCTS
MAMBA II

The Mamba II is the logical progression from the very popular Mamba. The Mamba II features a new fuselage with increased side area, balanced tail surfaces and tapered back wing that combine to improve aerobatic performance. This plane is a perfect match for a 3-cell Li-poly battery and a 20mm brushless motor. Specifications: wingspan—39 in.; wing area—315 sq. in.; weight—16 to 20 oz. The Mamba II costs $140.

Northeast Sailplane Products (802) 655-7700; nesail.com.

THUNDER TIGER
E-HAWK 1400

The New E-Hawk 1400 from Thunder Tiger has all the features of a larger high-performance electric sailplane in a more practical size. The E-Hawk 1400 has a 380-size direct-drive motor that packs a powerful punch and is small enough to fly anywhere. This almost-ready-to-fly plane is available in three color schemes and has a sleek, white-gelcoated fiberglass fuselage. The kit includes a motor and propeller; you need only buy a radio, a 30A speed control and a 7-cell battery. Specifications: wingspan—55 in.; wing area—300 sq. in.; length—31 in.; weight—21 oz.
Thunder Tiger; distributed by Ace Hobby Distributors (949) 833-0088; acehobby.com.

HOBBICO
SUPERSTAR EP SELECT WITH AILERONS

The new, ready-to-fly, deluxe SuperStar EP Trainer is now electric-powered and has ailerons for increased maneuverability. It also comes with a Futaba 4YF 4-channel radio system. Now you can have three-axis control for realistic flight control in a ready-to-fly package. This plane is completely built and covered, so you can be at the field in a matter of hours. It includes an electric motor, battery, speed control and propeller; you just supply the charger and a desire to get airborne! Specifications: wingspan—48.75 in.; wing area—402 sq. in.; weight—3.1 lb.; price—$249.99.
Hobbico; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; hobbico.com.

MULTIPLEX
EASY GLIDER & EASY GLIDER ELECTRIC

Multiplex announces two new high-performance Elapor foam RC airplane kits: Easy Glider and Easy Glider Electric. Both planes can be assembled quickly with CA, and the tough Elapor foam construction resists damage. Both airplanes offer elevator, rudder and aileron control and have a detachable two-piece wing that makes them easy to transport.

Easy Glider is a sailplane that can be aero-towed, hand-towed with the supplied towline, or hand-launched from a slope. The Easy Glider Electric features a geared Permax Speed 400 motor with a folding propeller. This power combination allows quick climbs to altitude and gentle glides back to earth. Specifications: wingspan—71 in.; length—44.25 in.; weight—25 oz. (Easy Glider), 35 oz. (Easy Glider Electric).
Multiplex; distributed by Hitec RCD (858) 748-6948; hitecrcd.com.

FUTABA
9C/9CS SYNTHESIZED TRANSMITTER MODULE & RECEIVER

Futaba owners can now have crystal-free RC flying with this new synthesized transmitter module and receiver. Futaba's newest synthesized module takes the hassle out of having to install a different crystal in the transmitter each time you want to change frequencies, and it virtually eliminates having to wait your turn for a frequency clip! Now you can simply turn two dials to select any frequency from channel 11 to channel 60. To change channels on the new Futaba R319DPS synthesized receiver, just adjust two potentiometers on the receiver to match the selected transmitter channel, and your plane is ready to fly. The Synthesized Transmitter Module costs $100. The 1.25-ounce receiver measures 1.3x2.1x0.8 inches and costs $180.
Futaba Corp. of America; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; futaba-rc.com.

ICARE
GILES 202

ICARE has just released a new and unique, 25-percent, all-composite Giles 202 aerobatic airplane. It boasts a large, 74-inch wingspan with a relatively light airframe (10.5 pounds). Designed with electric power in mind, the plane's lightness doesn't mean a sacrifice in strength and stiffness because it has a sturdy composite construction (honeycomb structure and hollow-core molding). The plane features a carbon-fiber wing-joiner tube, clip-on stabilizer halves and rudder and a hinged canopy (just like on the full-size aircraft!). With the recommended Plettenberg Xtra25 Outrunner brushless motor and a 10S3P Li-poly battery, the Giles 202 will have unlimited aerobatic performance. Specifications: wingspan—74 in.; wing area—980 sq. in.; length—66 in.; weight—10.5 lb; price—$900.
ICARE Sailplanes (450) 449-9094; icare@telts.com; icare-rc.com.

VMAR
ESCAPE ARF

This .40- to .50-size ARF low-wing trainer is the perfect second plane for a pilot who's looking for hotter performance and an introduction to aerobatics. The Escape features all-wood construction and is covered in the VMAR-exclusive Polycote covering system, in which all of the graphics are embedded. Say goodbye to peeling decals! The plane also includes an aluminum spinner, pilot, aluminum clevises and the new safety-stopper fuel tank. It could easily be converted to electric power. Specifications: wingspan—63.25 in.; wing area—730 sq. in.; length—48 in.; weight—5.2 to 5.6 lb. The Escape costs $100.
VMAR; distributed by Richmond RC Supply (877) 727-2329, (604) 940-1066; richmondrc.com.

FMA DIRECT
FMA SERVO LAB & POWER FORCE VRLI2

Here's a must-have for all pilots who want to make sure that their servos are operating at full strength. The new Servo Lab SA-10 operates on 4.5 to 6 volts and works with all brands of servos—analog and digital. The SA-10 simulates the receiver output pulse to the servo and can measure the transmitter pulse to test your transmitter's joysticks and trims for accuracy. Test servos on the bench or in the models and even set up a new aircraft without having to use the transmitter. It costs $40.

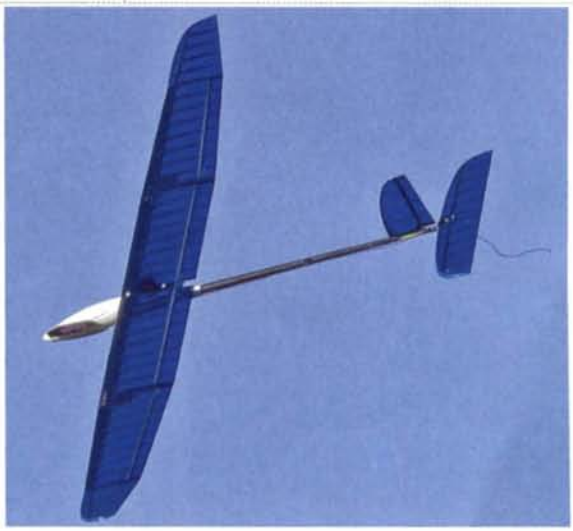
The new Power Force VRLI2 is a voltage regulator for powering high-current radio systems in RC aircraft. This unit can accept power from 2- to 4-cell Li-poly or 5- to 12-cell Ni-Cd or NiMH packs. The VRLI2 has a user-selectable, 5 to 6V up to 10A, continuous-current output. That's more than enough power to drive a large plane full of high torque and/or digital servos. Tune in to the FMA website for pricing information.
FMA Direct (800) 343-2934; (301) 668-4280; fmadirect.com.

WATTAGE
SLOW JAZZ BIPE

This 3-channel indoor slow flyer features a factory-assembled, carbon-fiber frame with lightweight clear covering and comes with a motor, propeller and gearbox. It can easily fly in a 50x50x25-foot area, and you'll be pleasantly surprised by its responsiveness and maneuverability, even at walking speeds! It comes with lightweight hardware and uses standard micro radio equipment. Specs: wingspan—26 in.; wing area—485 sq. in.; length—31.5 in.; weight—5.5 to 6 oz.; wing loading—1.65 to 1.8 oz./sq. ft.
WattAge; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.

ULTRAFLY
NEW BRUSHLESS MOTORS

Designed for gear-drive applications, the brushless, sensorless D/13/32 motor is perfect for park flyers that weigh less than 2.2 pounds. The outrunner design is a direct fit into most Speed 400 and Speed 480 gearboxes, with a shaft diameter and size comparable to most 400-size motors. When used with the appropriate gear ratio, the D/13/32 can turn props from 6 to 11 inches in diameter. With a gearbox, the D/13/32 costs $80; without a gearbox, it's $70. Specs: shaft diameter—0.09 in.; shaft length—0.47 in.; motor diameter—0.925 in.; motor length—1.7 in.; max input power—160 watts; max rpm—40,000.
Ultrafly; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; greatplanes.com.

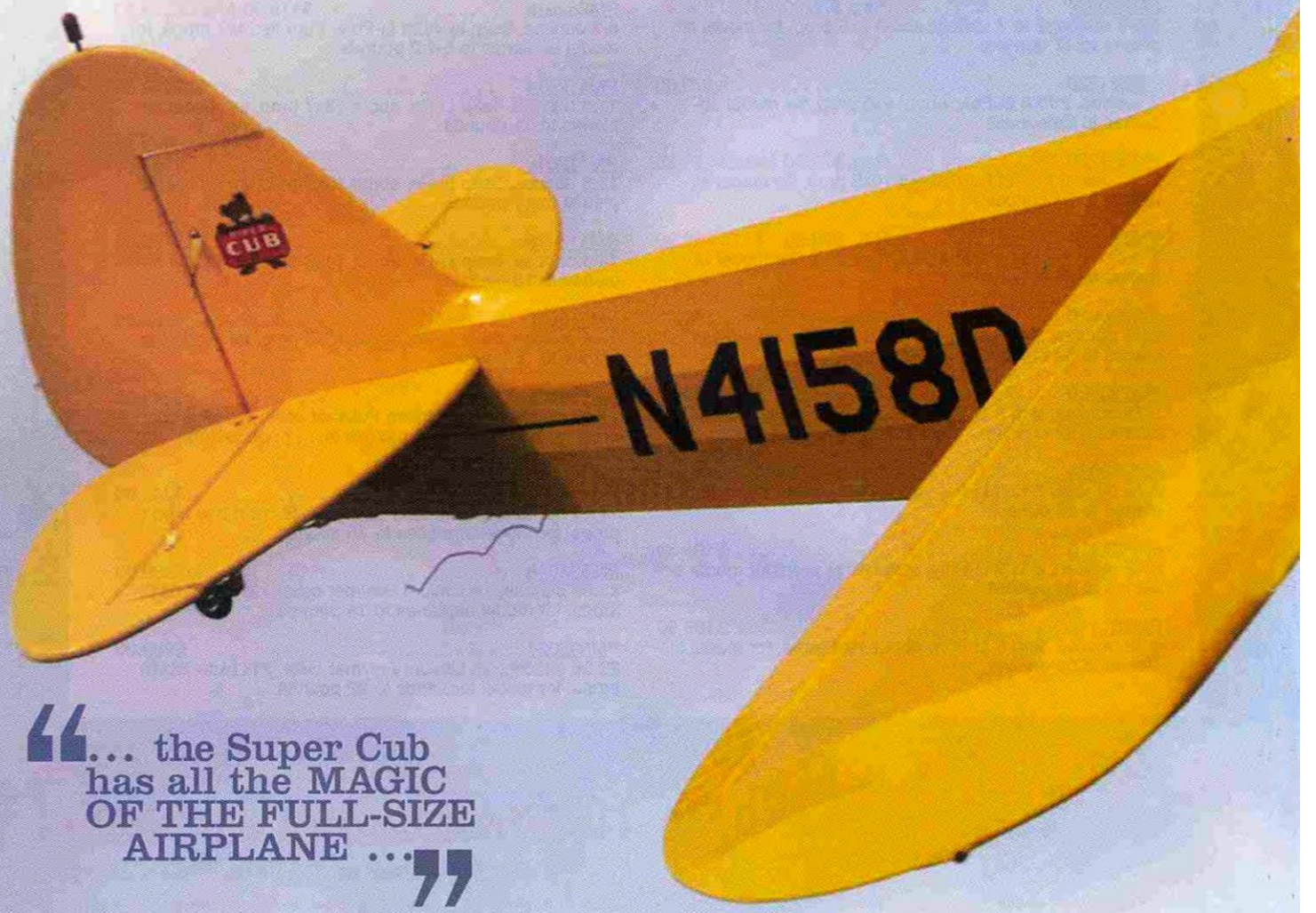


NORTHEAST SAILPLANE PRODUCTS
HYPER 1.8E

This electric sailplane is truly a technological breakthrough! It combines newer Drela-designed airfoils (tweaked by some of the best aerodynamicists in eastern Europe), a long wingspan and a three-piece wing (with optional flaps), and it weighs just 10.25 ounces! This is the lightest and strongest airframe of its size and type! It's a perfect vehicle for Speed 400 F5J competition. With its high aspect ratio, clean airframe and excellent airfoil choice, it offers a wide speed range. It's also easy to fly and offers maximum performance with very little tweaking. The Hyper 1.8E comes fully built and ready for radio installation, and you can outfit it with a Speed 400 for F5J contest flying or a 20mm Hacker brushless and 3-cell Li-poly pack for ultralight thermal soaring.
Northeast Sailplane Products (802) 655-7700; nesail.com.

DAVE PATRICK MODELS

SUPER CUB



"... the Super Cub has all the MAGIC OF THE FULL-SIZE AIRPLANE ..."

BY GERRY YARRISH > PHOTOS BY GERRY YARRISH & DERON NEBLETT

A sport-scale ARF with performance to spare

OFTEN FLOWN BY BUSH PILOTS, the Piper PA-18-180 Super Cub has been equipped with skis, floats and giant low-pressure tundra wheels so it can operate in very rugged terrain. It has been used to transport supplies, people and even animals and is considered by many to be a flying pickup truck! The Super Cub can also be found at small airports and airfields all over the country. In model form, Piper Cubs remain among the most popular RC choices.

SPECIFICATIONS

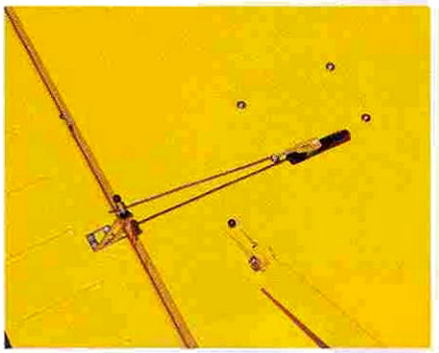
MODEL: Piper PA-18 Super Cub
MANUFACTURER: Dave Patrick Models
TYPE: scale ARF
WINGSPAN: 105½ in.
LENGTH: 72 in.
WING AREA: 1,600 sq. in.
WEIGHT: 17 lb. 5 oz.
WING LOADING: 24.9 oz./sq. ft.
ENGINE REQ'D: .90 to 1.50 glow; 25cc gas
RADIO REQ'D: 5-channel (rudder, flaps, aileron, throttle, elevator)
PRICE: $599.99

COMMENTS

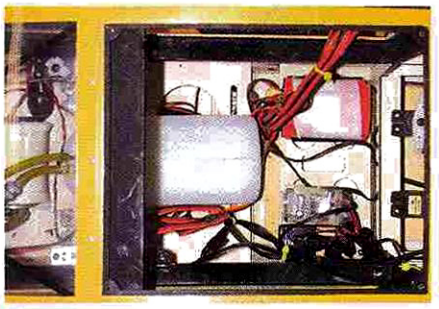
The Dave Patrick Models Super Cub is a great way to get into scale. It looks great, has excellent flight characteristics and is very easy to assemble. It comes with everything you need to build it, and the workmanship is topnotch.

HIGHLIGHTS

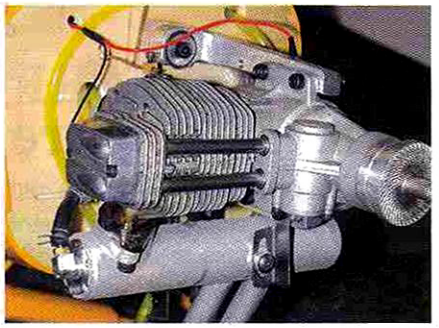
- Subassemblies come completely UltraCote-covered.
- All hardware comes painted to match the covering.



The aileron servos are under flush-fitting hatch covers. Notice the scale corrugated aileron surface.



The radio gear is in the bottom of the cabin area. Access through the removable skylight and the side windows is easy.



The O.S. 1.20 Surpass 4-stroke provides plenty of power for the Super Cub. The Slimline muffler has a preheat chamber and produces gobs of thick white smoke.

The Dave Patrick Models (DPM) Super Cub is an impressive 1/4-scale reproduction of a late-'70s to mid-'80s variant. With all his attention to detail and the many extras he includes with his ARF, Dave has elevated this all-yellow aviation icon to an impressive new level. Let's look a little closer.

IT'S ALL IN THE DETAILS

What really sets this model apart from other ARFs is its level of scale accuracy. Items such as the fully articulated, shock-absorbing landing gear, the plug-in wing design and the streamlined, aluminum wing struts (all painted) add greatly to its appearance. The painted-fiberglass engine cowl, windshield and formed inset side windows all fit nicely into place. But these are only the exterior details.

Internally, the Super Cub's parts and assembly are equally impressive. The airframe has laser-cut parts, and all the glue joints are properly secured. The control surfaces are slotted for the hinges, and the holes for various assembly bolts are already drilled. It is obvious that much effort has been put into producing a strong, light structure.

Assembly begins with the landing gear. They come covered and painted, and each shock-absorbing strut is fitted with two springs and a fiberglass cover. Four metal fittings secure the gear to the fuselage, and the axle rods slide into place. A flange at the end of each axle keeps the wheels in place; small setscrews allow adjustment of the spacing between the wheels and the axle support. A DPM

The shock-absorbing landing gear is included in the kit—very scale-looking!

This tailwheel assembly is part of the Super Cub's package—nice touch for an ARF.

medium leaf-spring tailwheel assembly and steering arm are included in the kit.

ENGINE INSTALLATION

The instructions suggest a unique way of installing the engine. Instead of attaching the engine cowl after you've installed the engine, the cowl comes already drilled for scale placement. To install the engine (I used an O.S. 1.20 Surpass 4-stroke), first measure the firewall-to-cowl-nose distance and then assemble your engine and engine mount to match, plus 1/8 inch. Then remove the cowl and place the fuselage on its tail with the firewall facing straight up. Position the engine/mount assembly on top of the firewall and slip the cowl back into place. Attach the spinner's backplate on the prop shaft and move the engine around until the backplate is aligned with the cowl nose. Carefully drip some medium CA onto the engine mount to tack-glue it to the firewall, and remove the cowl. Now you can remove the engine and drill the attachment holes for the mount. For my model, I installed a 5/8-inch-thick plywood spacer between the mount and the firewall.

I used a McDaniel's 1300mAh onboard glow driver for starting the engine. It also improves engine reliability by keeping the plug hot below 1/4 throttle. I installed a Slimline smoke muffler and an electric smoke-oil pump. I had to remove the molded-in carb intake in the bottom of the cowl to make room for the exhaust pipes.

The fuel tank is supported with a slide-in plywood tray that fits between two notched rails. The tray is locked into place with two small screws.

FLAPS AND AILERONS

The model has flaps inboard of each aileron. The aileron servos are attached to the inside of flush-fitting hatches, and only the ends of the servo arms are exposed. Sullivan's rugged steel control horns are used with the ailerons. The flap servos are mounted on rails within the wing, and the pushrods exit through a small opening in the flap bay and are attached to a metal arm that comes built into each flap. Servo hatches provide access to the flap linkage. The flaps and the ailerons have scale offset hinges and rounded leading edges. I used Pacer Technology Hinge Glue to install all the hinges.

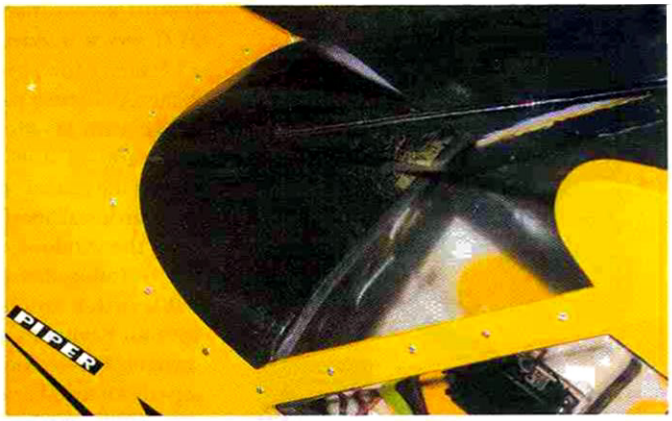
An aluminum carry-through tube supports the wings, and nylon wing bolts hold the wing panels tightly against the top of the cabin sides. Two aluminum brackets screwed into the landing-gear support block anchor the wing struts to the fuselage, and formed-metal brackets connect the top of the struts to the wing. Realistic-looking jury struts are also included. To add a bit more life to the already impressive Super Cub, I installed

SCALE DOCUMENTATION

THE DAVE PATRICK MODELS Super Cub is an excellent place to start if you want to get into sport and fun-scale competition. In fact, at the 2004 U.S. Scale Masters Championships in Gardener, KS, an ARC version of this kit was covered, detailed and painted for competition in the Expert class!

One important requirement for scale competition is scale documentation, including a photo of the full-size aircraft. An excellent source of this kind of material is Bob's Aircraft Documentation: (714) 979-8058; bobsairdoc.com. Bob Banka has provided good-quality photos and 3-view drawings for many years, and his catalog is a must-have for any scale modeler. If you need scale information for a Piper PA-18 Super Cub, this is the place to look!

The tail surfaces gain a lot of rigidity from the rigging cables and fittings. Do not fly your model until you have installed them.



Instead of permanently gluing the windshield into place, I secured it with small sheet-metal screws. Notice the black finish added to the model's interior; it looks better than bare wood!

IN THE AIR

Powered by an O.S. 1.20 Surpass 4-stroke turning an APC 15x8 prop, the Super Cub is ideally suited to my kind of off-the-grass, "bush-pilot" flying. I test-flew the model on a day with moderate crosswinds.

CONTROL THROWS

Elevator: 1¼ in. up/down (high); ¾ in. up/down (low); expo 60%
Rudder: 2 in. right/left (high); 1¼ in. right/left (low); expo 60%
Aileron: (w/differential) 1⅜ in. up, ½ in. down (high); ⅞ in. up, 5/16 in. down (low); expo 60%
Flaps: first notch ½ in. ; full down 1 to 1¼ in.

GENERAL FLIGHT CHARACTERISTICS

>Stability: as you would expect with a lightly loaded ¼-scale Super Cub, stability is positive from full throttle all the way down to the stall break!

>Tracking: I was pleasantly surprised by how straight the first takeoff run was; I gave almost no rudder correction to maintain a straight track! In the air, the model is most definitely a rudder plane. You need to coordinate aileron and rudder for proper turns.

>Aerobatics: the Super Cub can do any aerobatic maneuver that the full-size plane can do and more. Loops and rolls require a dive entry to build up airspeed. Turnaround maneuvers such as wingovers and hammerheads are very easy to do; the Cub has good but not unlimited vertical performance. Snap rolls require a slightly farther aft CG and about ½ throttle during entry. They can be done nicely with rudder and elevator control only.

>Glide performance: with flaps up, the Super Cub will surprise you. At idle, the model has perhaps a 12:1 glide ratio and remains very controllable. Aileron effectiveness is diminished somewhat and requires increased rudder.

>Stalls: power off, flaps up: the model stalls gently and is easy to recover. With flaps down, the stall is more pronounced and requires more altitude to recover. Power-on stalls occur at a somewhat higher angle of attack, but the break is very gentle. Recovery is very quick; simply release up-elevator!

PILOT DEBRIEFING

The Super Cub would make a great first tail-dragger model and is ideal for anyone interested in fun-scale competition. Everything about it is predictable, and because it has flaps, the model can be brought in for short, steep landings without fear of overshooting the runway. The flaps require a fair amount of down-elevator trim.

wingtip navigation lights, landing lights and taillights (see "How to Install Lighting Systems in your ARF" in the February 2005 issue). My pilot figure comes from Cajun R/C.

GEAR USED

ENGINE: O.S. 1.20 Surpass 4-stroke
RADIO: JR XP9303
PROP: APC 15x8
FUEL: Wildcat Helimix 30% nitro

MODEL SETUP

I used the JR XP9303 computer radio, 4 DS8101 servos (flaps and ailerons), 2 NES 4131 servos (rudder and elevator), an NES 537 servo for throttle and a JR 4.8V, 3000mAh battery pack. I replaced the stock wheels with Du-Bro heavy-duty composite servo arms. I used auxiliary channels to mix all the related servos together.

Radio installation is easy if you don't glue in all the windows. I left the two side windows off altogether so I'd be able to get at the radio switch and battery-charging jacks without having to unscrew the removable skylight. This also makes plugging all of the servo leads together a bit easier.

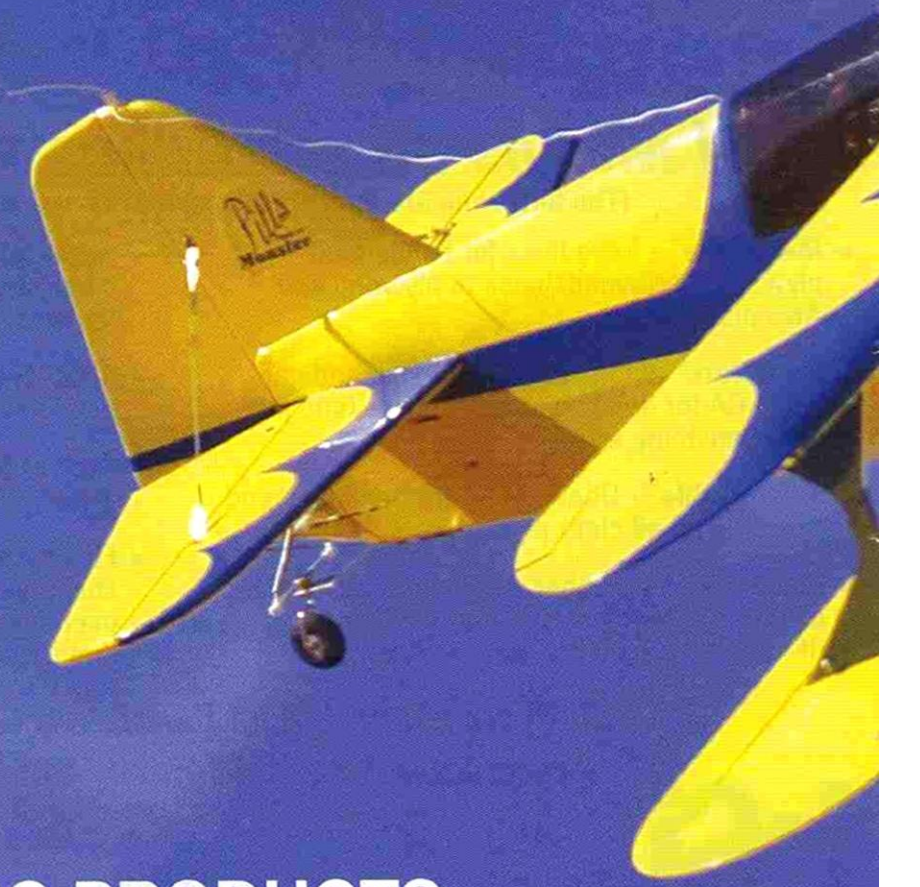
The ailerons have differential control, and the flaps use the 3-position flap/landing-mode switch. I also programmed the flap servo speed to fully deflect in 3 seconds. This looks very scale and minimizes attitude trim changes during flight. The flap channel is also mixed with another auxiliary channel to turn the landing lights on when the flaps are fully deployed.

Pull-pull rudder cables come with the kit; the elevator uses a single carbon-fiber tube with two threaded pushrod wires, each leading to one elevator half. Rigging cable and fittings provide additional stiffness to the tail surfaces. To dress up the model, you can replace the foam kit wheels with Du-Bro 4½-inch-diameter, ¼-scale Cub wheels. These are also available from DPM.

If you have never flown a ¼-scale model, the Super Cub would be a great place to start. It has all the magic of the full-size airplane and possesses great flying characteristics. No white knuckles here—just all-out flying fun! ✈

See the Source Guide on page 142 for manufacturers' contact information.

"This AEROBATIC BIPLANE has a lot going for it, and most PILOTS WILL ENJOY FLYING IT."



CARL GOLDBERG PRODUCTS

PITTS MO

BY JOHN REID > PHOTOS BY JOHN REID

The best just got better!

DESIGNED BY THE MASTER HIMSELF, Curtis Pitts, the Pitts Monster Model 12 is considered to be one of the best biplanes designed, and why not? Its classic biplane lines were integrated with a large radial cowl that was designed specifically to fit around its 360hp Russian-built Vedeneyev M-14P (PF) radial engine. Carl Goldberg Products has now reproduced this expertly designed aircraft as its latest offering, the Pitts Monster Model 12 ARF.

ISTER ARF

CARL GOLDBERG PRODUCTS PITTS MONSTER ARF

SPECIFICATIONS

MODEL: Pitts Monster ARF Model 12
DISTRIBUTOR: Carl Goldberg Products
TYPE: sport aerobat
LENGTH: 56 in.
WINGSPANS: (top/bottom) 60/58 in.
WING AREAS: (top/bottom) 555/534 sq. in.
WEIGHT: 11.6 lb.
WING LOADING: 24.46 oz./sq. ft.
ENGINE REQ'D: .90 to 1.08 2-stroke, 1.20 4-stroke
RADIO REQ'D: 4-channel w/7 servos
PRICE: $400

COMMENTS

This is a very well-constructed, outstanding flyer. All of its pieces are of top quality and expertly covered. The assembly goes quickly because of the great parts fit, and the finished plane looks so impressive that it's almost a showpiece.

HIGHLIGHTS

- Top-quality construction
- Great-looking color scheme
- Excellent parts fit

THE KIT

The kit includes a built-up balsa fuselage, wings, rudder and elevators. The cowl and wheel pants are of high-quality fiberglass construction. There's a well-stocked hardware package, landing gear, wheels, a tailwheel assembly, a fuel tank, engine mounts and a heavy-gauge tinted-plastic canopy. A very well-written, 30-page, photo-illustrated manual gives clear, precise assembly instructions.

CONSTRUCTION

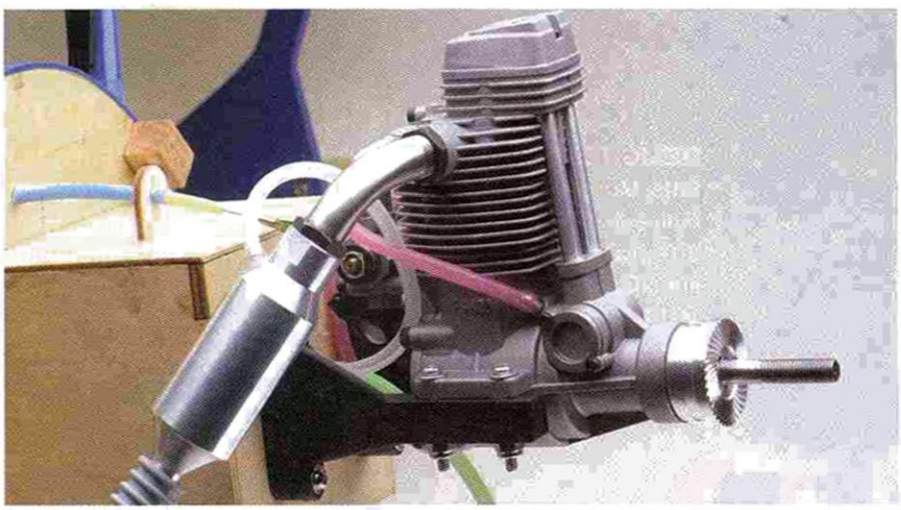
Wing assembly This is usually where I talk about removing the wrinkles in the covering, but on the Pitts Monster, there weren't any wrinkles to shrink! I went right to hinging the ailerons with the CA hinges and connecting the linkage to all four aileron control surfaces. A very strong string is used to pull the aileron servo wires through the wings. The holes that route the servo wires through the wings are rather small, and it's difficult to pull the wires through them. Be sure to firmly attach the servo plugs to any extensions you use because if they come off while you're pulling the wires through the wing, you will spend a considerable time rethreading the wires.

With all four aileron servos connected, I had only to install the bottom wing on the fuselage. It's used to align the horizontal stabilizer.

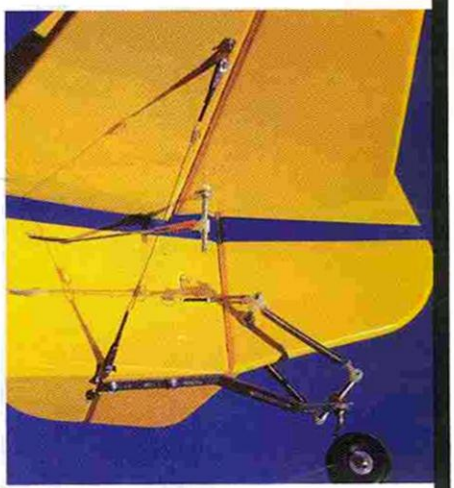
Tail construction The horizontal stabilizer is set up so that the tips are equidistant from the fuselage sides at the tail and from the trailing edge of the bottom wing next to where the wing meets the fuselage. When I had the stablilizer squarely aligned, I marked the fuselage outline on the top and bottom of the horizontal stabilizer, removed the covering and epoxied the stabilizer into place with 30-minute epoxy. I used the same procedure with the vertical stabilizer, making sure that it was perpendicular to the horizontal stabilizer.

I attached the control horns (threaded 6-32 rods) to both elevators and the rudder. I used Loctite on all the nuts to make sure that nothing would vibrate loose. To complete the tail assembly, I hinged both elevators and the rudder to the horizontal and vertical stabilizers.

Fuselage construction The main landing gears are bolted into place using 6-32x¾-inch socket-head bolts. The wheel pants are all predrilled and bolted to the main landing



There's ample room beneath the cowl—even for the big Magnum 1.20 4-stroke! Engine installation and maintenance are a snap; simply remove four cowl screws, and you're in business.



Rudder control incorporates a pull-pull system that also moves the tailwheel. The threaded control horns permit precise control-surface adjustments.

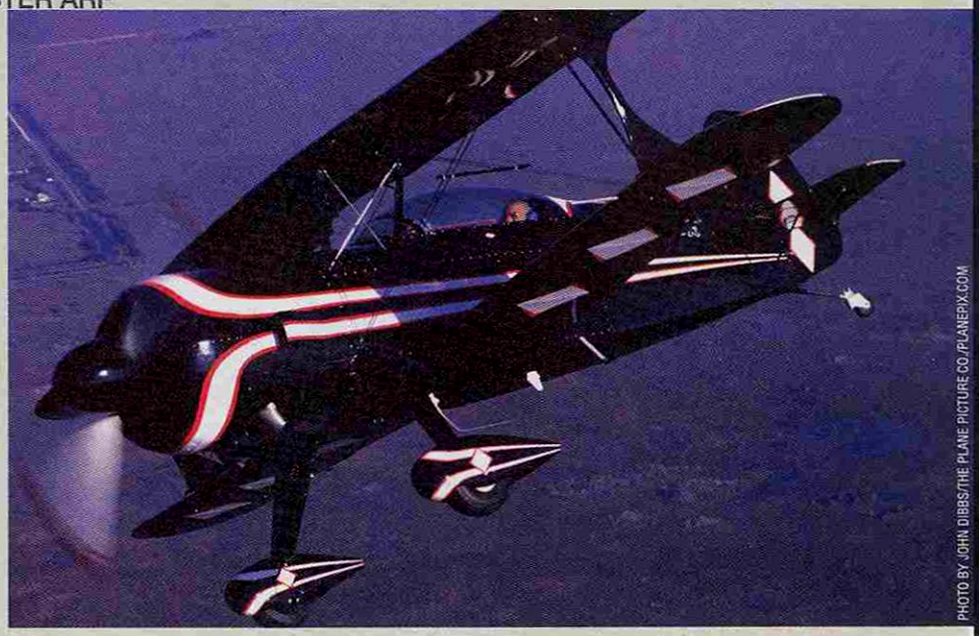


PHOTO BY JOHN DIBBS/THE PLANE PICTURE CO./PLANEPIX.COM

THE MODEL 12 PITTS SPECIAL: HAIRY-CHESTED BIPLANE

WHAT'S BETTER THAN A BIPLANE? That's obvious: a biplane with a radial engine. And what's better than a biplane with a radial engine? A radial-engine biplane designed by Curtiss Pitts!

When you saddle up in the Model 12, it feels like a much larger than usual two-place Pitts, but it really isn't any bigger. As I dropped into the rear cockpit, however, I never doubted that it's a big guy's airplane—mainly because the fuselage is much wider than the Pitts's to accommodate the 360hp Russian M-14P radial engine.

The M-14P engine is the best thing to happen to sport aviation since Curtiss designed the first Pitts Special. The Russians and Romanians cranked them out by the thousands; they cost far less than Lycomings and Continentals, they're built like tanks, and ... well ... they're round. So we now see lots of fun airplanes built around them.

The engine is started by means of a pneumatic system that pumps air into the cylinders in sequence, and if you have all the valves set correctly and you hold your mouth just right, it fires instantly. It sounds so rough that it's little wonder that one of its early nicknames (it still has an image problem) was "Macho Stinker"—in keeping with the long line of Pitts Special "Stinkers."

I was told two things before I flew the Pitts. First, because prop clearance is limited, you fly it off the ground in a three-point position; second, because the prop turns in the "wrong" way (counterclockwise as seen from the cockpit), I'd be using my left foot rather than my right to handle torque and gyroscopic precession on takeoff.

As I started the throttle forward, I realized that they hadn't prepared me for something else: acceleration like nothing I'd experienced outside of something like a Bearcat. The runway was visible only as slim wedges on both sides of the nose, but I forgot about the lack of visibility as soon as I felt myself being slammed into the seat cushions. Yee-hah!

The airplane clawed its way into the air and immediately moved right: that big prop was doing its best to torque the airplane. So my left foot went forward. Then it went forward some more. Zowie! Was this thing ever a tiger!

I went upstairs at a record rate (3,000fpm plus), all the time basking in the delicious melody that can be sung only by a round engine. Love it!

At altitude, I had to remind myself that—in his words—Curtiss designed it to be an "... old man's aerobatic airplane." Even so, it still manages to roll better than just about any other biplane out there. And doing loops was a hoot; that big engine and prop make you feel as though a locomotive is dragging you over the top.

Jim and Kevin Kimble (pittsmodel12.com) of Zellwood, FL, offer Model 12 Pitts kits that feature shorter wings and a fuselage that, together, make their homebuilt airplane much more nimble.

With that big nose hiding the runway, I flew the typical turning approach with a slip at the end for visibility and to control the glide slope. After touchdown, the airplane is much more directionally stable than any other Pitts, and that's really nice.

Do I like the airplane? Well, I now have a brand-new M-14P engine sitting in my hangar; that must say something.

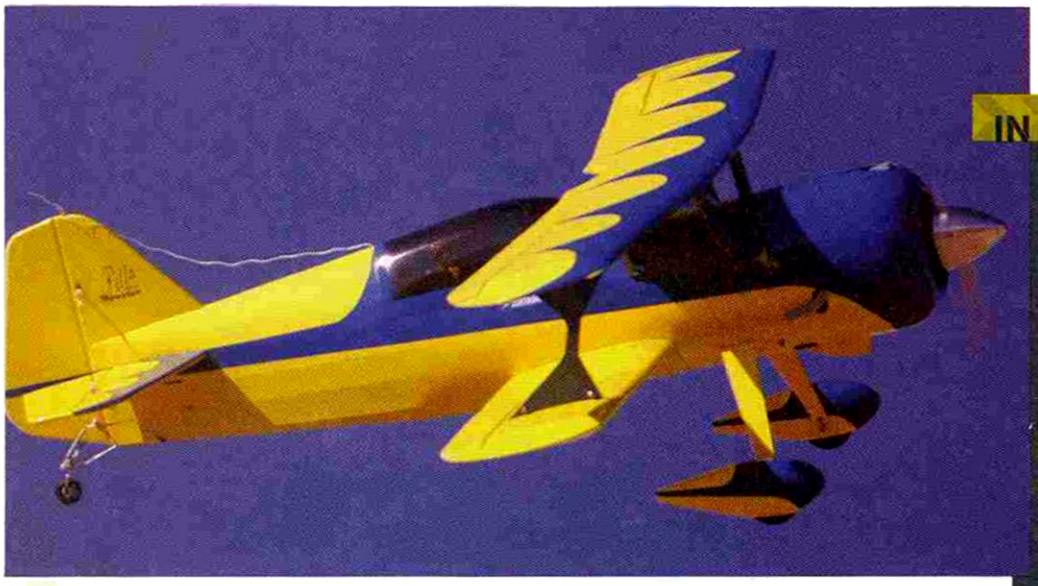
—Budd Davisson

Visit Budd on the Web at airbum.com.

gear over the wheels and axles. I constructed the tailwheel assembly and attached it to the underside of the rear fuselage, and then I connected the steering tiller arm to the pull-pull control horns on the rudder.

I inserted the four cabane struts into the upper front part of the fuselage; each is held in place by two 4-40 socket-head screws. This is the perfect time to thread the upper aileron servo Y-harness through the fuselage and to connect the harness to the front cabane struts. Screw the eight, ¼-inch eyebolts for the I-struts into the threaded blocks on both wings. Install the upper wing now, and connect the aileron servos to the Y-harness on the cabanes. Now install both I-struts in the top and bottom wings, and secure all of the 4-40x½-inch socket-head bolts to the upper and lower wings.

I held the belly pan in place on the underside of the wing and marked its position so that I'd know where to remove the covering. Because the belly pan is such a snug fit, be careful when you apply the glue so that you don't inadvertently glue it to the fuselage. I found that Bob Smith Industries IC Gel worked perfectly for this. It did not



run or drip into the wing saddle, and I was able to use kicker to set it instantly.

I attached the flying-wire cables and brackets to the vertical fin and stabilizer. The wires are attached to the brackets using clevises, and I adjusted the cables so that they would be snug and not have any slop. It's important to make sure that they are not so tight that they distort the flying surfaces.

Engine mounting The mounting holes and blind nuts are already installed in the fuselage for the cowl, so there's no room to adjust the cowl after you've installed the engine. Install the engine on the mounts and allow 6 inches between the back of the mounts and the front of the thrust washer. Because there's so much room inside the Pitts Monster's cowl, I decided not to mount the Magnum XL 1.20 RFS 4-stroke in the inverted position shown in the manual. This is just a matter of preference; I find it easier to connect and disconnect the glow-plug driver from the top of the airplane instead of having to reach underneath.

I routed my throttle pushrod so that it would run around the tank. Then I assembled the tank and installed it in the airplane using silicone sealant on the front of it so that it's firmly attached to the back of the firewall. For extra security, I surrounded the tank with foam rubber to hold it in place. Fuel tubing in three colors is provided for the fuel-tank outlet. This makes it extremely easy to tell which one is the vent line, which is the fill line and which is for the fuel.

With the engine installed and hooked up, I marked all of the positions for the cowl cutouts. I used the 4x12-inch plastic strip for this. I taped it to the fuselage with one end extending over the engine. I then marked all of the cutouts in the clear plastic and cut them out. Next, I removed the engine and installed the cowl on the fuselage. I transferred all of my cutout marks from the clear plastic to the cowl and cut the openings using a Dremel tool.

GEAR USED

RADIO: Airtronics
TRANSMITTER: VG6000
RECEIVER: 92875Z 7-channel
SERVOS: 947311 (6) and 94102 (1)
ENGINE: Magnum XL 1.20 RFS
FUEL: PowerMaster 15% nitro
PROP: Top Flite 16x8 Power Point

FINAL ASSEMBLY

Install the rudder, elevator and throttle servos inside the fuselage, and connect them to the appropriate pushrods. The rudder pull-pull cables are easy to install: first, attach each cable to the rudder control horns; then thread the cables through the fuselage and adjust their length using the servo control horn as a guide.

I glued my pilot and the canopy into place using canopy glue. The receiver and battery are held with Velcro®. Balance the plane and set the control throws according to its manufacturer's recommendations. That's it; the Pitts Monster is now ready for its first flight.

CONCLUSION

The Pitts Monster is a well-constructed ARF kit that can be assembled very quickly, and it has a flight envelope that any pilot will enjoy. I suggest that you pick one up as soon as you can so you won't have to envy your buddy when he shows up with one.

See the Source Guide on page 142 for manufacturers' contact information.

IN THE AIR

I equipped the Pitts Monster with a Magnum XL-1.20 RSF 4-stroke engine, a Top Flite 16x8 prop and PowerMaster 15-percent-nitro fuel. The engine hadn't been completely broken in, but after a 100- to 150-foot takeoff run, it had more than enough power to easily lift the 11.6-pound plane.

CONTROL THROWS:

Elevator: ± 2 in. (high); expo: 60%; ± 1 in. (low); expo: 20%
Aileron: ± 1¼ in. (high); expo: 60%; ± ½ in. (low); expo: 10%
Rudder: ± 3 in. (high); ± 3 in. (low); expo: 0

GENERAL FLIGHT CHARACTERISTICS

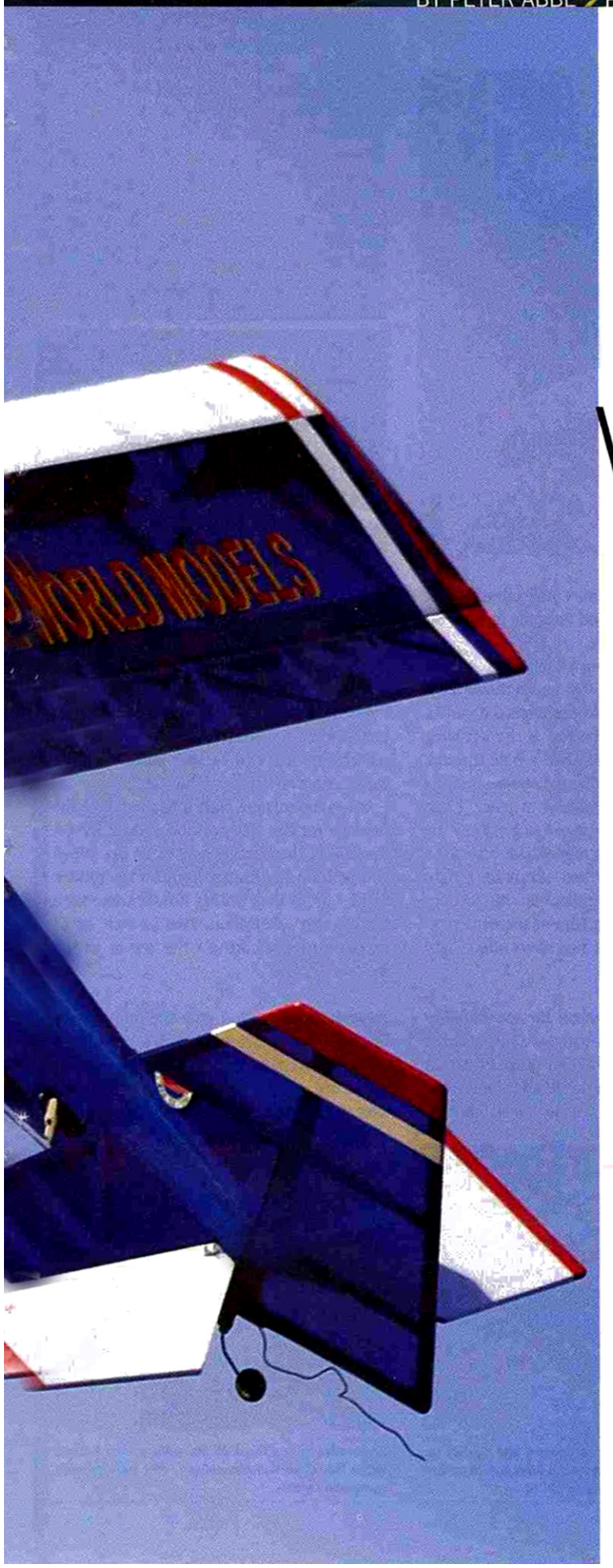
Stability: this is an extremely stable flyer that is very predictable, even while performing knife-edges.
Tracking: using the rudder, ground tracking is highly responsive. In the air, the plane goes exactly where you point it.
Aerobatics: the Pitts Monster will do everything the full-scale version does and is even capable of some 3D aerobatics.
Glide performance: dead-stick requires that the plane's nose be pointed downward and that it land with as much speed as possible.
Stalls: for a biplane, the stalls are relatively mild, and with rudder input, most tip-stalls can be corrected to some extent.

PILOT DEBRIEFING

This plane requires an experienced pilot at the controls, and its flight envelope is broad enough to satisfy experts. It's a blast to fly. Unlike most bipes, it does aerobatics with an almost pattern-like precision while showing the beauty and grace of a biplane airframe. Knife-edge flight requires very low rudder input; as a result, there is very little rudder coupling. Snap rolls are fast and very responsive. The rudder is extremely effective, even at slower speeds, and this could cause problems during landing if you give it too much rudder. Its bright color scheme makes it easy to see, and it's also easy to determine its attitude because the wings have a star pattern on their undersides. This aerobatic biplane has a lot going for it.

"... a PERFORMANCE-PACKED AEROBAT that's guaranteed to satisfy."

BY PETER ABBE > PHOTOS BY PETER ABBE & CHERI SASSMAN



THE WORLD MODELS FUN WORLD EP

High-voltage fun!

THE WORLD MODELS HAS A REPUTATION for producing low-priced, high-quality ARF models, and the Fun World EP is no exception. A scaled-down version of its popular .90-size sister ship, the EP is an economical entry into the world of electric 3D flight. Featuring superlight balsa and plywood construction, transparent covering and a two-piece wing, the EP is a performance-packed aerobat that's guaranteed to satisfy.

SPECIFICATIONS

MODEL: Fun World EP
MANUFACTURER: The World Models
DISTRIBUTOR: Airborne Models
TYPE: electric 3D fun fly ARF
WINGSPAN: 50 in.
WING AREA: 700 sq. in.
LENGTH: 50 in.
WEIGHT: 48 oz.
WING LOADING: 9.9 oz./sq. ft.
POWER REQ'D: 350W electric system
RADIO REQ'D: 4-channel w/4 servos (elevator, rudder, 2 ailerons)
PRICE: $99.99

COMMENTS

The Fun World EP is a good first electric 3D aerobat. Its superlow wing loading and large control surfaces yield a stable model that's capable of doing extreme maneuvers.

HIGHLIGHTS

- Easy to assemble
- Two-piece wing
- Wide performance envelope

KIT CONTENTS

The wing, fuselage and tail feathers are very light, well-built and beautifully covered with lightweight plastic film. A hardware package includes nuts, bolts, clevises, pushrods, control horns, CA hinges, aluminum wing tube, spinner, wire landing gear and lightweight foam wheels. A color decal sheet is also provided. The 10-page instruction manual details assembly with nearly 40 photos and illustrations.

ASSEMBLY NOTES

Wing Very little work is necessary to complete the wing. Simply cut the covering away to reveal the servo mounts, screw the servos into place and route the servo leads. I chose to set up my ailerons using the flaperon mix on my Futaba T-6XA transmitter; if you don't have a computer radio, you could use a Y-harness. Care must be taken when hinging all of the control surfaces to ensure that the hinge gaps are not too tight. If they are, maximum control-surface deflection will be impossible, and that will limit the model's 3D performance.

The removable wing panels are mounted on an aluminum tube that passes through the fuselage, and locater dowels align the panels. A bolt screwed into the top of the left wing panel secures the tube. Drill a hole through the top of the right wing panel, and install a self-tapping screw to hold it in place. I had difficulty getting the screw to tap into the tube, so I drilled and tapped the tube for a 6-32 bolt. Despite my best efforts for a tight fit, I had a 1/16-inch gap between the fuselage and the wing's trailing edge at the wing root. The gap didn't seem to negatively affect flight performance, though.

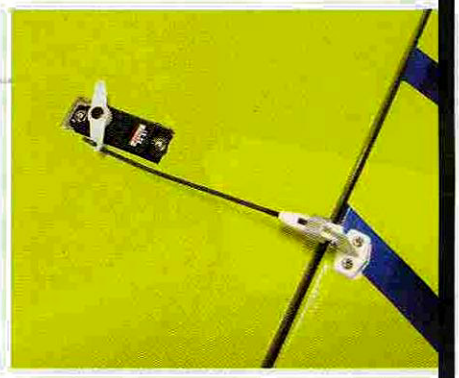
Tail feathers The vertical fin and stabilizer are glued into their respective slots, and the rudder and elevator are then hinged with CA hinges. Make sure that the elevator-joiner wire is in place before you glue in the stabilizer. If you don't, you will have to cut the fuselage to install it later. At the rear of the fuselage, screw the tailwheel assembly into a plywood plate. Drill a hole in the rudder to accept the tailwheel wire, and be sure to harden the wood with a few drops of thin CA.

Servo mounts are built into the tail of the fuselage for the elevator and rudder servos; that makes the linkages easy to set up. When you position the control horn on the rudder, make certain that it does not interfere with the elevator's deflection. Two 12-inch servo-extension leads connect the servos to the receiver.

Fuselage Before you glue the interlocking lite-ply battery tray into place, it's a good idea to make sure that you'll have an easy time installing and removing your battery pack after the tray has been secured to the fuselage.

The Fun World EP easily accommodates the Cermark CEM-600 BL2 brushless motor and MEC Superbox.

The rudder and elevator servos are installed in the rear of the fuselage to keep the linkages short and tight and make them easy to set up.



Each aileron is driven by its own servo. I used Hitec HS-81 servos throughout, and they provide adequate torque.

My Multiplex 3S2P 4000mAh, 11.1V Li-Batt fit perfectly. Velcro® straps hold the battery and allow it to be moved back and forth to adjust the model's center of gravity (CG). I wrapped a couple of rubber bands around the battery to prevent it from sliding around during flight.

I chose to power the model with a Cermark Hover Package, but the model's stock main landing gear and wheels do not provide adequate clearance for a 16x8 APC prop. I bent new gear that is 1 inch higher out of ⅛-inch music wire. I also replaced the supplied 2-inch wheels with Dave Brown 2¾-inch Lite Wheels. The main gear is mounted on a plywood plate in the base of the fuselage, but that setup proved to be very weak, and the gear was easily pulled out on my initial landings. I reinforced the inside of the fuselage with ⅛-inch lite-ply and balsa tri-stock to better secure the mount.

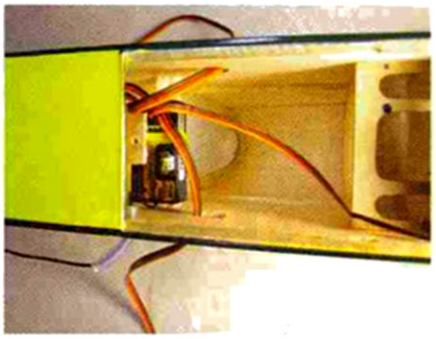
The Fun World EP easily accommodates the Cermark package that consists of an MEC Superbox and Cermark CEM-600 motor. The package includes a laser-cut firewall designed to fit the Cermark electric Banchee. The shape of the motor's firewall differed from that of this model's, so I traced the motor's cutout outlines onto the model's firewall and verified

POWER TO SPARE

THE CERMARK HOVER PACKAGE is a high-powered electric system that's capable of providing the Fun World EP with unlimited aerobatic performance. Each component in the system is carefully matched to provide optimal performance while operating within its specified limits. A Cermark CEM-600 BL2 brushless motor mated to an MEC 5:1 Superbox creates the muscle of this system. Swinging a 16x8 APC electric propeller, this powerplant produces enough thrust to hover models that weigh up to 60 ounces.

Regulating the system's current is Castle Creations' Phoenix 45 programmable ESC, which can handle a continuous current of 45 amps and peaks of 60 amps, even though it weighs only 1 ounce! The ESC can easily be programmed for many applications by using the throttle stick on your transmitter or via an optional USB adapter and your PC. For use with the Fun World EP, I turned off the brake, set the cutoff voltage to 9 volts and used the soft-start setting to protect the gearbox.

Powered by a Multiplex 11.1V, 4000mAh 3S2P Li-Batt, the system draws 50 amps at full throttle for a whopping 555 watts! At ½ throttle, the system draws approximately 250 watts; this is enough power to hold the Fun World EP in a hover! If you have ever had any doubts about the power of a modern electric system, the Hover package will quickly dispel them!



There is ample space for the full-size Hitec Spectrum dual-conversion receiver.

that it fit properly before I glued it into place.

Two removable hatches conceal the battery and the electronics, and I stiffened them by gluing a couple of 3/32-inch balsa strips across them. I also cut the covering away from the forward hatch and left the area beneath the motor open to ensure proper cooling for the battery, motor and ESC.

To finish the model, screw the canopy to the fuselage with four small wood screws and double-sided tape, and then apply the decals. When I peeled one of the larger decals from the decal sheet, it quickly curled up and adhered to itself. Be sure to peel the decals off slowly and carefully; an extra set of hands really helps here!

Model setup Proper setup can mean the difference between a model that flies like a sport plane or a 3D machine. I found the recommended CG starting point of 3.9 inches behind the wing's leading edge very conservative; it yielded stable flight characteristics but limited 3D performance. When I moved the CG back to 4.75 inches from the leading edge, the model had that 3D feel without being overly pitch sensitive. With the CG set at 5 inches, hovering and high alpha flight significantly improved, but the model required a more delicate touch on the elevator for smooth landings.

GEAR USED

RADIO EQUIPMENT: Futaba T-6XA transmitter; Hitec Spectrum dual-conversion receiver; 4 Hitec HS-81 servos; Castle Creations Phoenix 45 ESC

MOTOR: Cermark CEM-600 BL2 brushless w/MEC 5:1 Superbox

BATTERY: Multiplex 11.1V, 4000mAh 3S2P Li-Batt

PROP: APC 16x8 electric

WRAP-UP

The Fun World EP is well constructed, light and easy to assemble. It can be adapted to a wide variety of powerplants, and it's a versatile and economical model that is certain to appeal to many electric-flight enthusiasts. Whether you're interested in a stable sport model or a hot 3D airframe, the Fun World EP is guaranteed to deliver a world of fun!

See the Source Guide on page 142 for manufacturers' contact information.

IN THE AIR

IN THE AIR

With the Cermark Hover package providing power and a wing loading of only 9 oz./sq. ft., the Fun World EP's flight performance is fantastic. Takeoff rolls are very short, and vertical is unlimited at just over ½ throttle.

CONTROL THROWS

Ailerons: ± 30 deg. (high), ± 15 deg. (low)
Elevator: ± 35 deg. (high), ± 20 deg. (low)
Rudder: maximum possible

GENERAL FLIGHT CHARACTERISTICS

Stability: the model has a very stable feel at all speeds and doesn't exhibit any bad habits. At the manufacturer's recommended CG position, the wing has a tendency to rock during high alpha flight; moving the CG aft reduced this tendency.

Control response: oh, yeah! The Fun World does exactly what you tell it to do when you tell it to do it! As long as the prop is moving air, the large control surfaces remain very effective.

Aerobatics: whether you're looking for a stable aerobatic platform or 3D performance, the Fun World EP delivers in spades! The airframe has stood up to the most violent snapping maneuvers I could throw at it; low rates help smooth out conventional maneuvers.

Glide performance: the model glides very well when the power is cut. To control the rate of descent, use a little power when landing.

Stalls: they are very controllable and occur only at low speeds and at a high angle of attack. Reducing elevator and adding power will quickly pull the model out of a stall. Moving the CG backward actually reduces the tendency to tip-stall.

PILOT DEBRIEFING

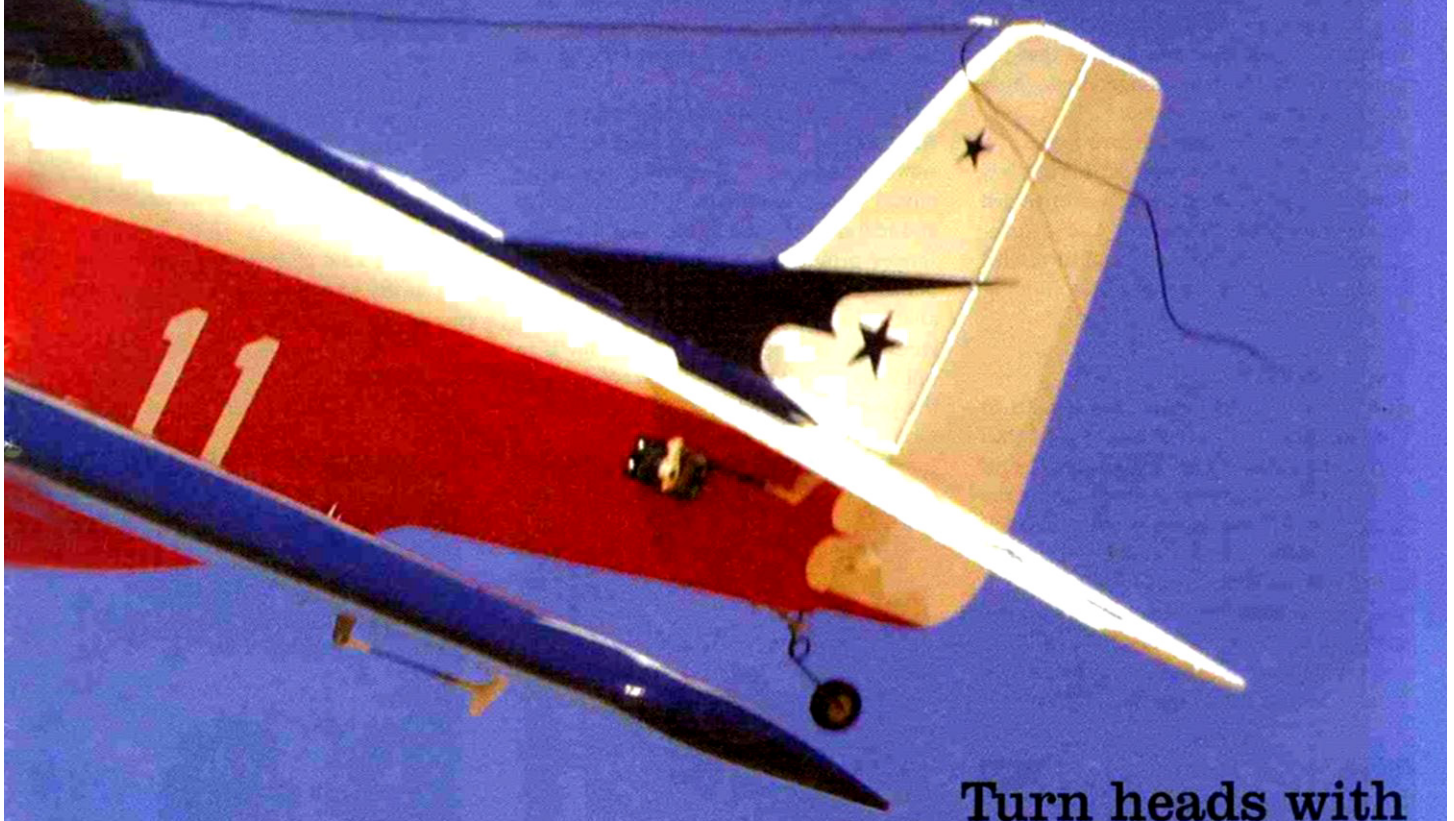
The Fun World EP is the most pilot-friendly, high-performance model I have flown. It performs loops and rolls with ease. Moving the CG aft significantly increased the rudder's effectiveness and virtually eliminated any sign of pitch and roll coupling.

The model can do hovering torque rolls, high alpha flight and rolling harriers. The model can do The Wall very hard without snapping out of the maneuver! Its low mass makes snap and spin recovery virtually instantaneous. The most interesting maneuver I have done is an inverted hovering flat spin! Coupled with the Cermark Hover package, this model offers nearly unlimited aerobatic capability!

"... the Miss America has one of the most beautiful color schemes ever to adorn an airplane."

BY SCOTT HAMPTON > PHOTOS BY JOHN REID

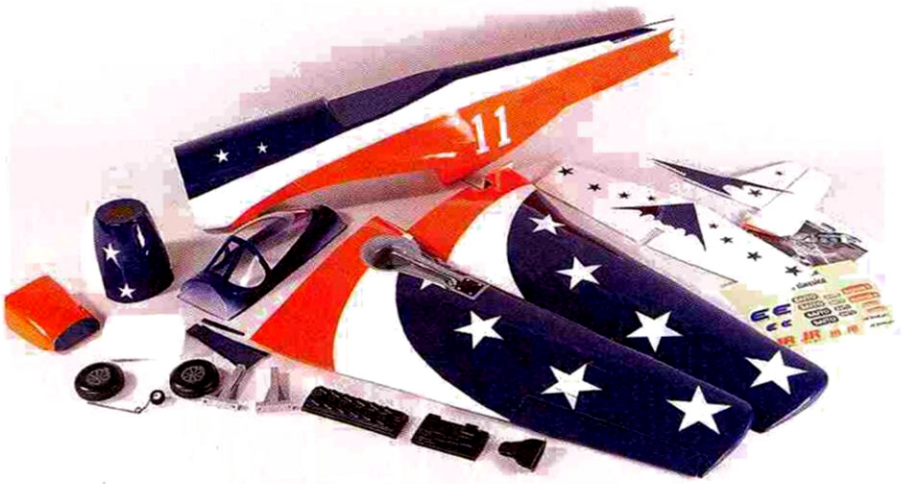
HANGAR 9 P-51D MISS AMERICA



Turn heads with Reno's patriotic racer

IN 1944, THE MUSTANG WAS CREATED at North American's plant. After the War, it was modified from the North American P-51D and went on to become one of the fastest and most recognizable Mustangs around. No wonder; with its smooth lines and easy curves, I can see why they named it "Miss America."

When Hangar 9 came out with a .60-size version of the Miss America, I just had to have one. I have come to expect top quality from Hangar 9, and in my opinion, the Miss America is one of its most impressive warbird ARFs.



SPECIFICATIONS

MODEL: .60 P-51D Miss America
DISTRIBUTOR: Horizon Hobby Inc.
TYPE: standoff scale plane
LENGTH: 55.75 in.
WINGSPAN: 65.5 in.
WING AREA: 745 sq. in.
WEIGHT: 7.5 lb.
WING LOADING: 23.19 oz./sq. ft.
ENGINE REQ'D: .60 to 1.00 2-stroke or .91 to 1.00 4-stroke
RADIO REQ'D: 5-channel with 6 servos
PRICE: $254.99

COMMENTS

This is one of the most enjoyable ARFs I have built; the assembly was quick and easy. It has a very concise and well-written instruction manual. Once finished, I had a very stable flying aircraft.

HIGHLIGHTS

- Complete hardware package
- Installed retracts
- Fiberglass cowl

IN THE BOX

Everything was well packaged in plastic bags and nicely sealed. Even inside the box, the plane looks beautiful, and as to be expected, the covering job is topnotch. I took the wings out of the bags and noticed that the retracts looked much stronger than those included in past Hangar 9 kits.

I inspected the fuselage and found the covering to be impeccable with very few wrinkles. All of the hardware was included along with a well-written and photo-enriched construction manual. All I needed to complete this plane was a radio, motor, glue and fuel line.

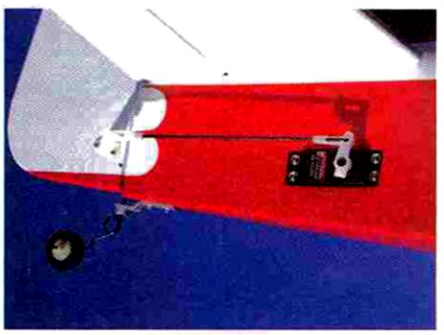
WING ASSEMBLY

The first step in the instruction book is to glue the hinges into the wing. I used thin Zap for this. After the glue had dried, I test-fit the wing joiner into both halves of the wing. When I was satisfied with the fit, I used 30-minute epoxy to glue the wing joiner and the wing halves together. Now it was time to build the retract servo tray and install it into the wing. I used a Hitec HS 77 BB low-profile servo for the retracts so I would be able to use my computer radio's end-point-adjustment function to fine-tune the control throws. I then cut the retract wires to the proper length and installed them. I cycled the retracts a few times to make sure that everything worked correctly and that the retracts firmly locked in both the up and down positions.

Next, I built the aileron servo trays. I used Hitec 425 BB Deluxe servos with a 12-inch servo extension. I glued the mounting blocks to the trays with 30-minute epoxy and mounted the servos on them using the screws provided with the servos. I then pulled the servo wires through the wing and attached a short Y-harness on the end of the wires. The last step for wing assembly is to hook up the ailerons to the servos. I used the provided hardware, which fit perfectly, to make a solid and responsive connection. The entire wing assembly took me about two hours to complete.

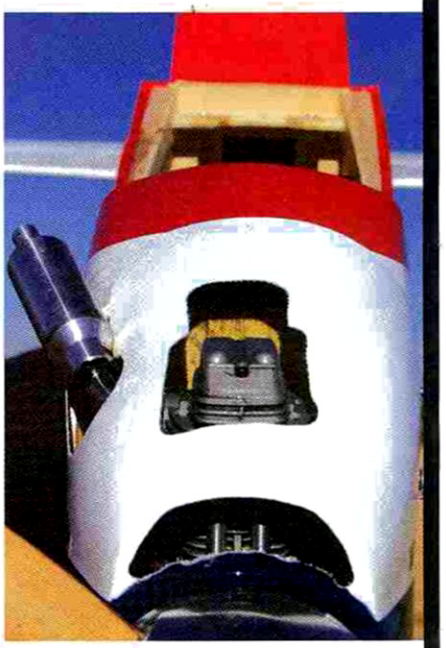
FUSELAGE ASSEMBLY

Begin by installing the tail section. I slid the



The servos are mounted close to the control surfaces to maintain a short pushrod connnection and provide positive control hookups.

With ample room for the radio components inside the fuselage, I was able to use the battery placement to balance the plane.



The Magnum RFS .91 engine fits neatly inside the cowl. All of the cutouts are on the cowl's underside, which results in a cleanly finished upper cowl.

IN THE AIR

For the Miss America P-51D, I used the Magnum .91 RFS 4-stroke engine with stock muffler, Zinger 14x8 wood prop and 15-percent PowerMaster fuel. This combination provides plenty of power to pull the 7.5-pound plane around the sky with some authority.

CONTROL THROWS

Elevator: ±1 1/16 in.; expo 0%
Aileron: 9/16 in. up, 1/2 in. down; expo 0%
Rudder: ±1 1/4 in. right and left; expo 0%

GENERAL FLIGHT CHARACTERISTICS

Stability: this plane handles very well at high speeds. Like most P-51s, the Miss America will stall at low speeds, but recovery is quick.

Tracking: the P-51 tracks very well on the ground. In the air, the plane flies straight and true, even maintaining altitude with little rudder correction in high-speed turns.

Aerobatics: this is a scale WW II P-51 model, and it will do all the same scale maneuvers as the full-size plane. The model flies through each maneuver with smoothness and authority.

Glide performance: if you set the balance correctly, the plane will glide well with 1/4 throttle. Without power, keep the nose pointed downward, or the plane will stall.

Stalls: when the plane climbs at a 45-degree angle, I can cut the power to idle, and it will tip-stall; however, once the nose points down and after a little speed builds up, the plane recovers smoothly.

PILOT DEBRIEFING

I enjoy flying this plane every chance I get. It is a good-flying aircraft, and the Magnum .91 RFS 4-stroke pulls the plane around with ease. On the ground, it takes only about 20 feet to get it in the air. It can easily fly at 1/2 throttle, and the plane just cruises around the sky nice and easy. At full throttle, it flies close to scale speed, and the engine has plenty of power to do all of the scale maneuvers that the full-size one can. These include split-S's, loops, rolls and all combinations of these maneuvers. I make landing approaches at a little less than 1/4 throttle. When the plane gets close to the ground, I lower the throttle and flare it to a nice 3-point landing. The field I fly at is a little rough and really tests the landing gear—and it has held up just beautifully.

horizontal stabilizer into the slot and marked where I had to remove the covering. I used 30-minute epoxy and glued the stabilizer into place, double-checking its alignment by measuring to a reference point at the front of the fuselage. After the glue had dried, I set the vertical stabilizer into the precut slot and marked where I had to cut the covering. Again, once I had removed the covering, I glued the vertical stabilizer into place with 30-minute epoxy. I used a 90-degree square to set the vertical stabilizer perpendicular to the horizontal stabilizer. I hinged the control surfaces using thin Zap.

The rudder and elevator servos are screwed into the servo trays and mounted onto the back of the fuselage. I used Hitec 425 BB Deluxe servos with a 12-inch servo extension.

GEAR USED

RADIO EQUIPMENT: Hitec Eclipse 7 transmitter; 5 Hitec HS-425 Deluxe servos; 1 Hitec HS-77BB low-profile servo for the retracts; Hitec RCD 3800 receiver

ENGINE: Magnum .91 RFS 4-stroke

FUEL: PowerMaster 15%

PROP: Zinger wooden 14x8

ENGINE INSTALLATION

I began by gluing the servo tray for the throttle servo inside the fuselage with 30-minute epoxy. I attached the engine to the supplied aluminum engine mount and then mounted the entire assembly to the firewall with bolts and blind nuts. For power, I used a Magnum XL .91 RFS 4-stroke engine. The width of the engine matched the predrilled holes on the firewall, and that made installation easy. I assembled the fuel tank and installed it in the nose of the fuselage with foam packed all around it to keep it in place. I installed the throttle pushrod and made adjustments at the transmitter so that the carburetor would open and close completely.

FINAL ASSEMBLY

When everything was installed and hooked up, all I had to do was set up the cowl and canopy and balance the plane. I attached a paper template to the fuselage, which extended out over the engine. After cutting out all of the holes for the exhaust pipe, needle valve and glow plug, I removed the engine and put the cowl in place. I made the cutouts in the cowl and reinstalled the engine. I had to make some small adjustments to the cutouts, but overall, the fit was pretty close. I like the look of aluminum spinners, so I decided to use one instead of the supplied plastic red spinner.

I cut out the canopy and glued the backrest along with the canopy to the fuselage using canopy glue. The last and probably most important step is balancing the plane. The instruction manual recommends a starting point of about 4 3/4 inches back from the wing's leading edge. I was able to move the battery to achieve the balance point without having to add extra weight.

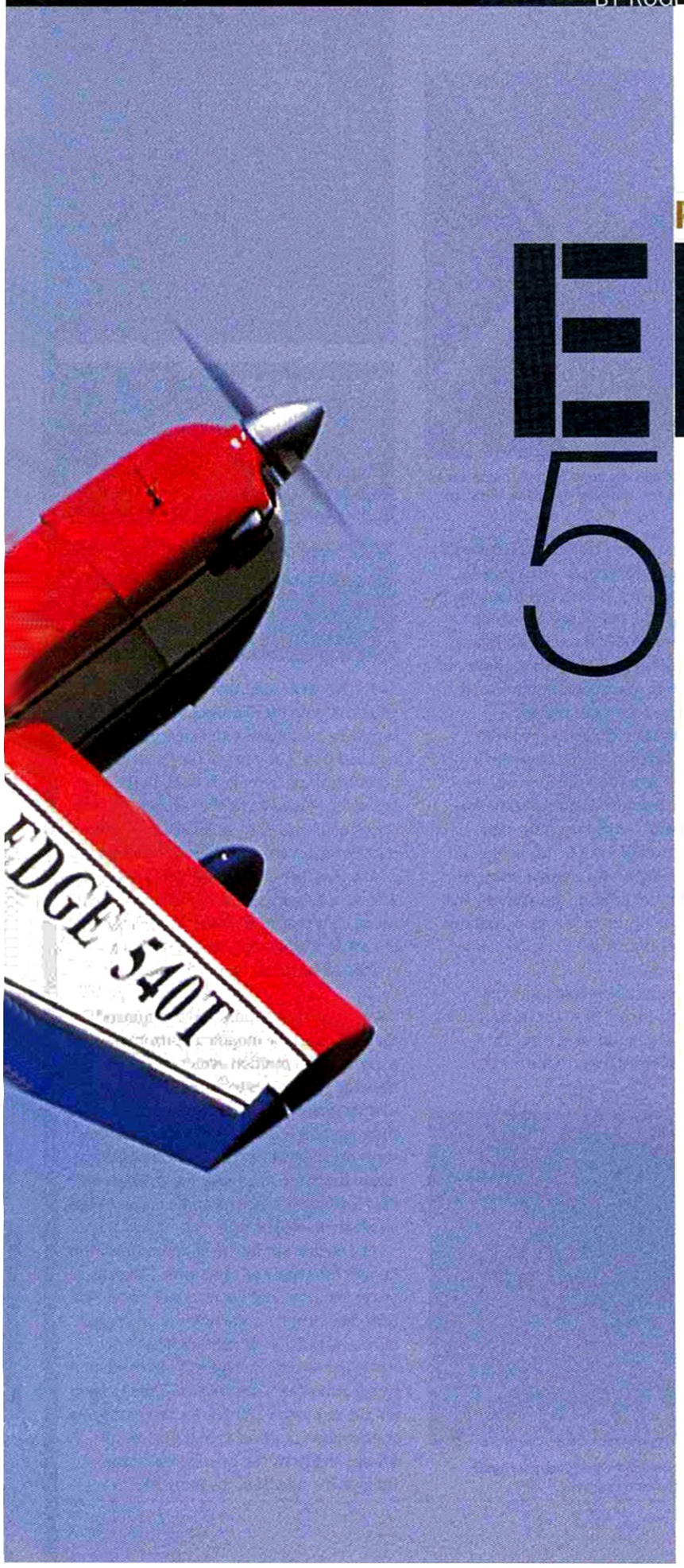
CONCLUSION

The Hangar 9 Miss America has one of the most beautiful color schemes ever to adorn an airplane. If you are searching for a plane that flies as good as it looks, look no further. Add this ARF to your flying fleet, and you'll be sure to turn heads at the flying field. ✈

See the Source Guide on page 142 for manufacturers' contact information.

"Vertical performance is OUTSTANDING and seems UNLIMITED!"

BY ROGER POST JR. > PHOTOS BY PETE HALL



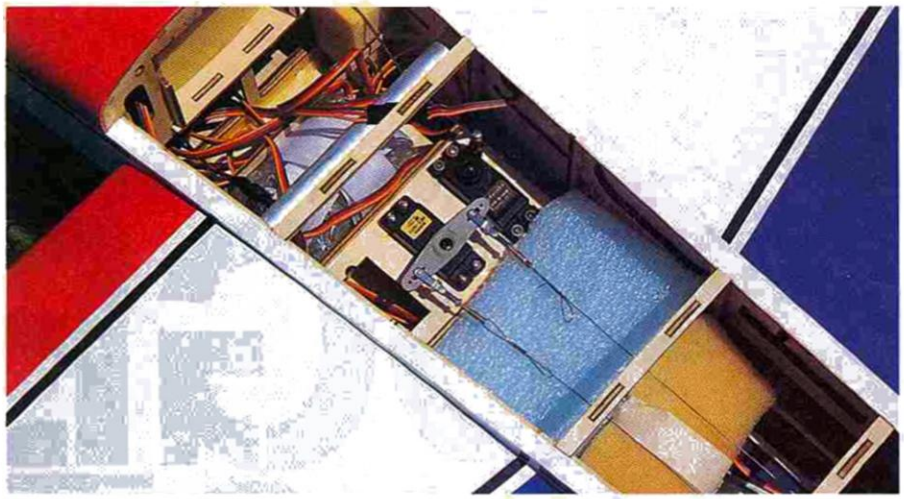
PACIFIC AEROMODEL MFG.

EDGE 540T

Giant-scale performance from a midsize aerobat

RECENTLY, I HAVE BEEN BURNING UP THE SKIES with a great-flying, ¼-scale Edge 540, but its large engine consumed fuel—and my fuel funds!—more quickly than I liked. Plus, I had to assemble it at the field, and this cut into my flying time. So I opted to downsize my Edge to something more fuel efficient that I'd be able to take to the field—completely assembled—in the back of my SUV and that wouldn't drastically drain the fuel funds. The search was on!

I soon found Pacific Aeromodel's Edge 540T .40/.72 ARF. Its 59-inch wingspan and listed powerplant requirement met the fuel/cash-flow requirement, and it fit perfectly into the back of my truck. This aerobat comes built up out of laser-cut parts and covered in iron-on film, and it features plug-in wings, dual aileron servos, tail-mounted elevator servos and a pull-pull rudder, fiberglass cowl and wheel pants.



The huge radio compartment has plenty of room for a standard radio, and the large canopy/hatch allows easy access to the radio and the fuel tank. For balance, I installed the Hobbico HydriMax Ultra Sanyo 1450 NiMH, 6V flat battery pack aft of the servo tray.

SPECIFICATIONS

MODEL: Edge 540T .40/.72 ARF
MANUFACTURER: Pacific Aeromodel Mfg.
TYPE: aerobat
AIRFOIL: symmetrical
WINGSPAN: 59 in.
WING AREA: 620 sq. in.
WEIGHT: 6 lb. 2 oz.
WING LOADING: 22.74 oz./sq. ft.
LENGTH: 52.5 in.
ENGINE REQ'D: .40 to .53 2-stroke, .52 to .72 4-stroke
RADIO REQ'D: 4-channel w/6 servos (2 aileron, 2 elevator, rudder, throttle)
PRICE: $210

COMMENTS

The Edge 540T .40/.72 factory-assembly quality is superb. The complete hardware package and the extent of the completed detail work are real pluses, and they shorten the assembly time.

HIGHLIGHTS

- Superb quality
- High-quality hardware
- Time-saving extras

WHAT YOU GET

Pacific Aeromodels provides one of the most inclusive packages available and offers many details to shorten assembly time. A complete, high-quality hardware package contains everything to complete the model, including an engine mount and an assembled fuel tank with fuel lines attached. All of the control surfaces come counterbalanced, presumably to eliminate flutter during high-speed flight.

You need a .40 to .43 2-stroke or a .52 to .72 4-stroke, a 4-channel radio with 6 servos, two 6-inch aileron-servo extensions, two 12-inch elevator-servo extensions, a propeller and a 2½-inch spinner.

ASSEMBLY

Wing The wing halves are assembled first, and the process starts with the ailerons' attachment, using CA hinges, to each half. Firmly tug the ailerons to ensure that they are secured to the trailing edge. The aileron servos are now installed; note their orientation in the photo. The covering is already trimmed and ironed at the aileron- and elevator-servo locations—a welcome, timesaving feature. Servo leads are pulled through the ribs via the tied-string method. Before I pulled the extension's wire through the wing ribs, I taped its connector to the aileron-servo wire's connector to ensure that they'll stay together in flight.

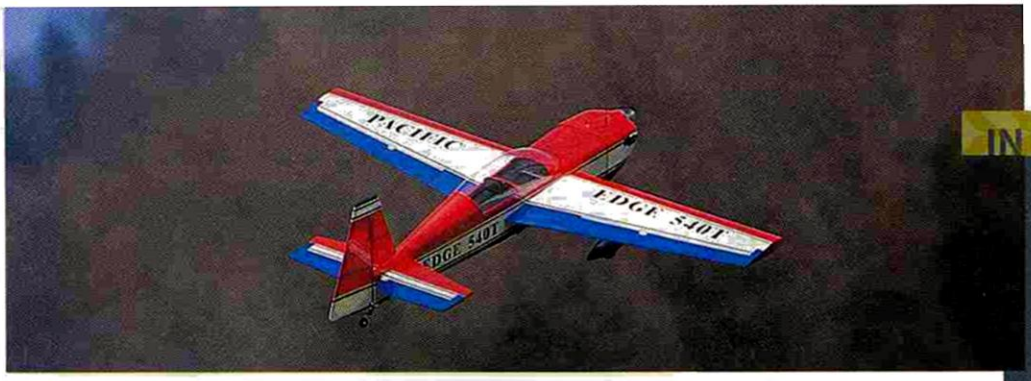
Special touches include the predrilled control-horn holes in the ailerons (this holds true for all of the control surfaces) and the cut-to-length, assembled, aileron-servo linkages with Z-bends on one end and metal clevises, locknuts and rubber O-ring keepers on the other end (ditto with elevator linkages). Attach the control horns to the ailerons, and then install the aileron pushrods as indicated. I centered the servos using the radio before I installed the pushrods.

Install the antirotation pins, and then check the wing halves' fit to the fuselage using the supplied aluminum wing tube. There aren't any cardboard tubes inside the Edge 540T's wing ribs, and that makes sliding a wing half onto the aluminum tube interesting; plenty of finesse and patience are required here. Use a round file to enlarge the antirotation-pin receptacle holes in the fuselage sides. When fitting the wings and lining the pins up with these holes, it's imperative that you check the wing halves' incidence to ensure that they are, and will remain, equal. The wing halves are held in place with ¼-20 nylon bolts that go through the fuselage from the inside and into threaded nuts that are secured inside the wing root's rib.

The O.S. .70FS has more than enough power to haul the 6-pound 2-ounce Edge through any aerobatic routine that you're capable of flying, and it supplies great vertical performance as well.

Fuselage Pacific Aeromodel recommends that the engine be mounted horizontally. I concur, as this position avoids your having to hack the cowl to bits to fit the engine and muffler underneath it. I used an O.S. .70 FS for three reasons: it is a heavier engine that prevents the model from being too tail-heavy; it makes less noise when running (noise at the field is always a concern); and it ensures a better power-to-weight ratio.

The engine was mounted as described (the firewall has predrilled holes with T-nuts in place), but note that the manual's stated 11/64-inch drill-bit size for the holes in the engine mounts should be ⅛ inch. Also, consider where the throttle linkage will run in relation to the carburetor's control arm. I had to reorient the carburetor 180 degrees and change its control arm's position so that the throttle linkage and its plastic housing didn't run through the middle of the fuel tank.



The fuel tank comes completely assembled and has three fuel lines (clear, red and green) attached to it. It is also wrapped in protective foam, but it needs additional foam in the front and at the sides before it's installed. When the tank is in place, the instructions say it's time to glue its wooden retainer piece into place behind it. To make it easier to remove the tank in future, I opted not to do this and instead stuffed an oversize piece of foam behind the tank to secure it.

Trim and install the cowl, and hook up the fuel lines as described. Once the propeller and spinner have been attached (the Great Planes 2½-inch metal spinner is a perfect fit), the forward fuselage assembly is complete.

Empennage Add this to the list of timesaving details: the covering has been removed from all the areas where glue is to be applied to the horizontal and vertical stabilizers, and the rudder's leading edge has been drilled and grooved to accept the assembled tailwheel strut. After I had installed the stabilizers (I checked their alignment with the wing as the epoxy cured), I attached the control surfaces. Glue the tailwheel strut into the rudder's lower leading edge before you attach the rudder to the vertical fin. Adding the elevator and rudder control horns finishes the empennage assembly.

Radio installation Install the radio, and hook up the control linkages as described in the manual. Note that there are specific installation instructions for the elevator servos to avoid your needing to reverse one. To stop the elevator servo leads from flopping around inside the fuselage, I placed foam pieces under and above them in two locations. The wires' connectors had been taped together just as the ailerons' connectors had been. The high quality of the rudder's pull-pull cable system is unusual in a plane of this size.

There's a tube for the receiver antenna, the switchplate's slot and bolt holes have been cut for you, and Velcro® strips on the receiver tray help you to secure your receiver in place. The only instruction I didn't follow was the one for battery placement. I saved that until the end and installed it where it was needed to balance the model.

Final details The canopy arrives trimmed, so when you've installed the hatch, you add the instrument-panel decals and pilot figures (optional), tape the canopy into place and secure it with the screws provided (check the canopy from the front to ensure that it looks level). Add the provided trim tape to complete the esthetic portion of the program. Assemble and attach the landing gear according to the instructions.

The Edge 540T's center of gravity is 3 inches aft of the leading edge. To balance my model, I installed the battery directly aft of the servo tray. I dialed in the recommended control throws on the radio (high and low rates with exponential), and I added flap-to-elevator coupling and rudder-to-aileron coupling. The elevators act as ailevators, and I set up a landing mode (this sets the flap and elevator positions when landing). Ah, computer radios!

WRAP-UP

The Edge 540T's attractive scheme, quality of workmanship, details that save assembly time and complete hardware package are the features to consider if you're thinking about buying this ARF. If you're looking to add a midsize aerobatic model to your collection, Pacific Aeromodels' 540T is the perfect choice. Happy tumbling.

See the Source Guide on page 142 for manufacturers' contact information.

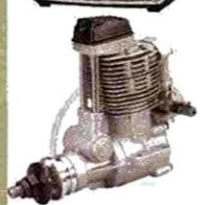
GEAR USED

RADIO JR 8103 w/2 NES-4131 servos for the elevator; 2 NES-9011 servos for ailerons; an NES-9011 servo for rudder; a Futaba S-148 servo for throttle

ENGINE O.S. Max .70 FS

PROPELLER APC 12x8

FUEL Sig 10% nitro



IN THE AIR

The O.S. .70 has more than enough power to zip the Edge around, and a down-low, high-speed pass can eat up the field in a few seconds. Its vertical performance with the APC 12x8 propeller is outstanding and seemingly unlimited.

CONTROL THROWS

Elevator: ± ½ in. (low); ¾ in. (high); 25% expo

Aileron: ± 7/16 in. (low); ± 1⅛ in. (high); 60% expo

Rudder: ± 2¼ in. (low); ± 3¼ in. (high); 25% expo

GENERAL FLIGHT CHARACTERISTICS

Stability: because of its neutral stability, the Edge 540T will stay where you put it until you input the next command.

Tracking: at a ⅔ throttle setting, the model was trimmed for hands-off flight—one click of left aileron trim and a couple of clicks of down-elevator trim. With these changes, the model tracked straight and changed direction only when I told it to.

Aerobatics: it will hover effortlessly and do regular and 3D aerobatics.

Glide performance: with its low wing loading, the Edge 540T is a dream to land, as it slows down quite nicely and lands almost as slowly as a trainer.

Stalls: in a low-speed stall, it shows a slight forward drop, but it does not tip-stall, and there isn't any loss of control.

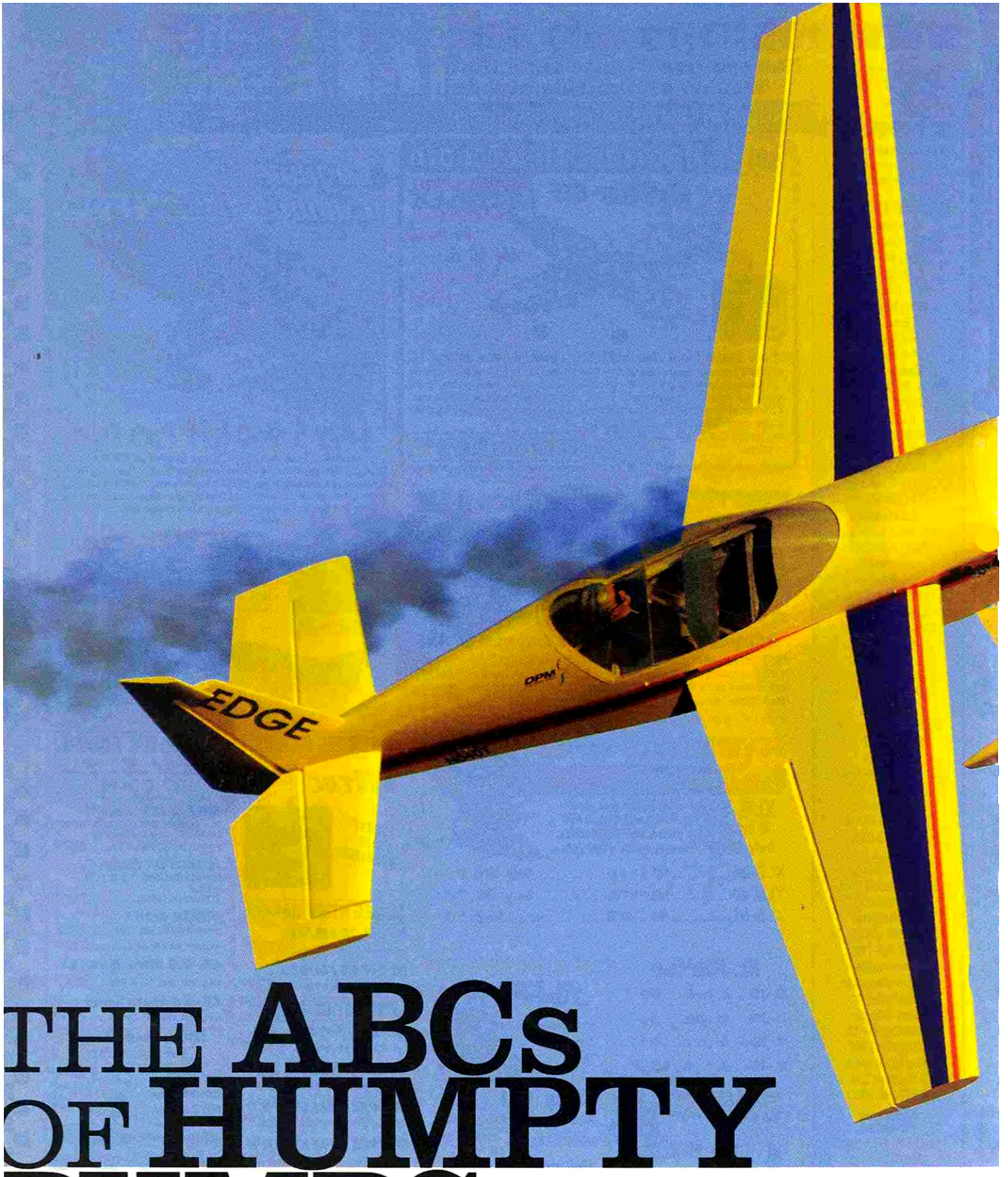
PILOT DEBRIEFING

With the elevator and ailerons on low rates, the 540T takes off quite easily. Landing rollouts of 10 to 15 feet are easy. Set up the approach speed by lowering the throttle and its trim (if necessary), and add a click or two of up-trim. Line up the final approach, keep the wings level, control the descent with the throttle, flare a couple of inches above the runway, and the model grooves right into a smooth landing.

So far, the airframe seems able to endure the G forces that come with high-speed maneuvers, so you needn't worry about structural failure. The power-on stall is nonexistent; the model keeps climbing, even in the vertical up line.

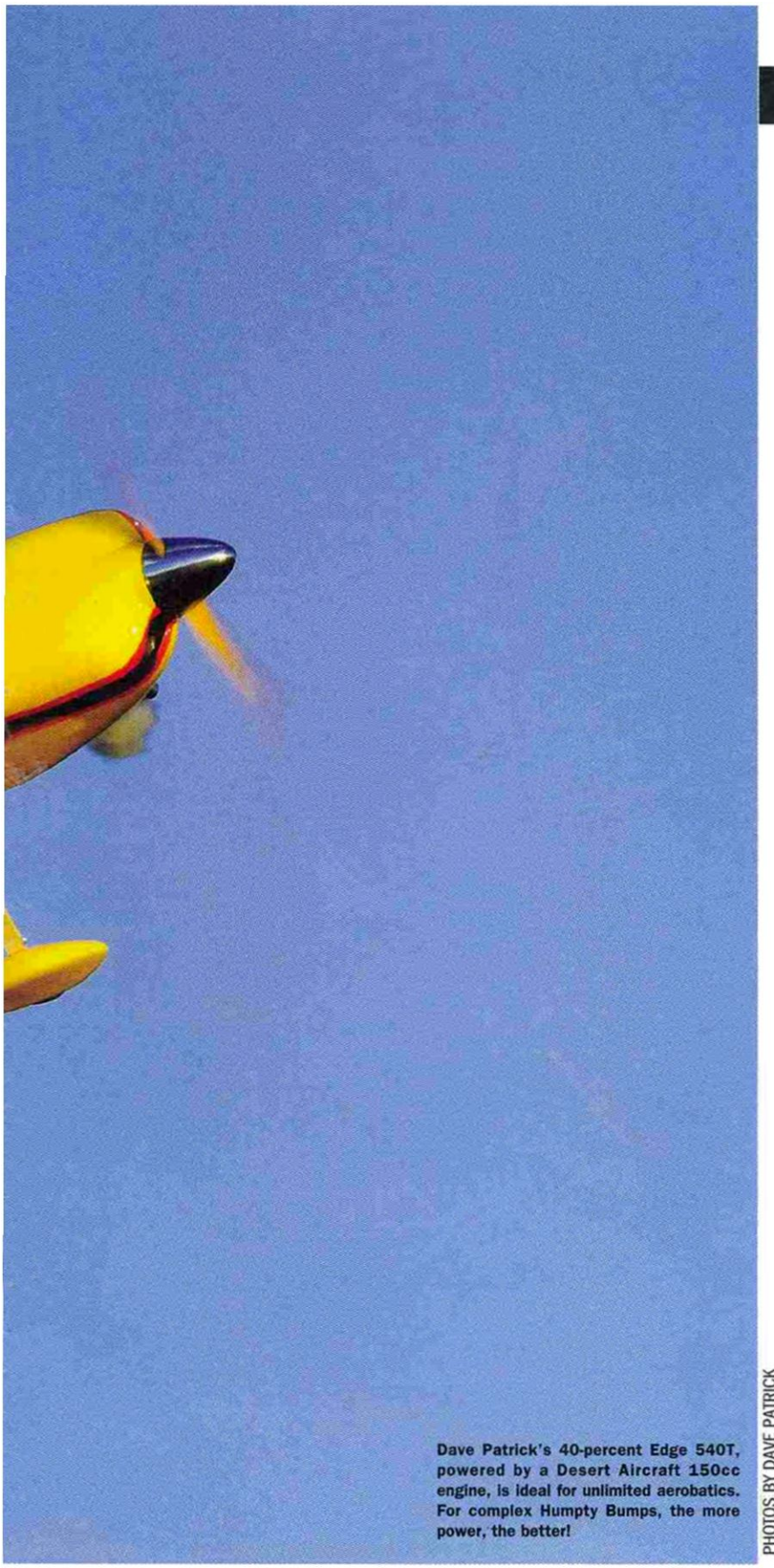
This model can fly a great, high-speed knife-edge pass with the required inputs for pitch-tucking and anti-proverse rolling. When flying a low-speed knife-edge pass, it has quite a pitch tuck, so you'll need to pull more up-elevator to keep the line straight.

It spins like a top, right side up or inverted, and it requires very little forward stick to maintain inverted flight. Add a click or two of downtrim, and it will fly inverted—hands off! After a couple of flights, I bumped up the throws on the high rates to the max. This made the model tumble better and roll much faster. With the elevators programmed to act as ailevators, the roll rate is very quick. It's also a neat feature to use when in hovering mode.



THE ABCs OF HUMPTY BUMPS

FROM **SIMPLE** TO **COMPLEX**



Dave Patrick's 40-percent Edge 540T, powered by a Desert Aircraft 150cc engine, is ideal for unlimited aerobatics. For complex Humpty Bumps, the more power, the better!

PHOTOS BY DAVE PATRICK

THE HUMPTY BUMP

BY DAVE PATRICK
ILLUSTRATIONS BY FX MODELS

THE HUMPTY BUMP PROBABLY has more variations than any other maneuver I can think of. In fact, the variations are practically limitless! Easy Humpty Bumps can be flown very well by a sport flier, and they're lots of fun to do. Fancy bumps can challenge the best pilots in the world! As with most maneuvers, the bump can be broken down into its basic aerobatic elements: the loop and the roll. Keep this in mind when you attempt any new maneuver.

The bump is a fun turnaround maneuver, or it can be a neat center-stage maneuver for show. It is also used as a wind-correction maneuver during competitions. In any case, a multitude of challenging components can be added to the bump, and they will help you rapidly improve your skill level.

★ ★ ★

WHAT YOU NEED TO START

Flying skills. First, let's assume you can perform nice, controlled loops and rolls in either direction. It would also be very helpful to know how to use rudder correction in a loop, but we will talk about that later.

Airplane. You don't need an exotic aerobat for most of the simpler Humpty Bumps. In fact, a clipped-wing Cub can do a very nice, simple Humpty Bump. For the more complex variants, you will need a pattern-style plane or an aircraft with a superior power-to-weight ratio such as the Edge 540 and the Extra 300.

★ ★ ★

LET'S GET STARTED!

Pick a nice, calm day and be patient. It takes time to learn something new, and even more time to refine it. Flight simulators are a fantastic way to learn and practice a new maneuver. If you don't have one, before you actually fly, try to envision the maneuver and fly through it in your head. It can be very helpful to "hand fly" a small hand-held model to imprint the maneuver in your mind. This type of practice is easy, very effective and highly recommended. Pilots of both RC and full-size aerobatic planes use this technique.

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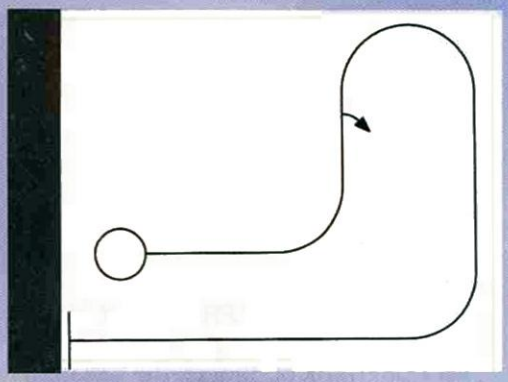
THE BASIC BUMP

The basic Humpty Bump is a perfect turnaround maneuver. In many ways, it "feels" very much like a ½ reverse Cuban-8. I think the easiest Humpty Bump of all is the one shown in Figure 1.

→



Schematic of a simple Humpty Bump.

→1
Entry
(straight & level)

→2
Pull into
¼ loop

Vertical
up line

→3
Half roll
(left or right)

→4
½ loop
(reduce power)

→5
Continue
down line
(throttle at idle)

→6
¼ loop

→7
Exit straight
& level

FIGURE 1 SIMPLE HUMPTY BUMP

From straight, level, upright flight (usually flying away from you), go to full power and pull into a ¼ inside loop. Establish a straight vertical up line and then perform a half roll (in either direction). Reestablish the straight up line and pull into a ½ inside loop. As you pass through the top of the loop, gradually reduce the power to idle. Establish a straight down line (longer than the up line), and pull into another ¼ inside loop to exit straight and level.

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POWER REQUIREMENTS

Typically, the more complicated the vertical lines are, the taller the maneuver will become. This means that more power is needed. If you plan to do a snap—or, heaven forbid, a double snap—on the up line, you need a huge amount of power! Snaps use up a lot of energy. The key to saving energy is to use the minimum amount of elevator and rudder throw during the snap and increase the aileron throw. Also, once the plane has started to snap, you can take out some elevator, and the plane will continue to snap. If you take out too much elevator, the model will stop snapping, so be careful; a good judge can see if you're cheating. The biggest mistakes I commonly see are caused by using too much or too little elevator.

Complicated rolls on the vertical lines also need big power. A "12-of-an-8-point-roll" means that you have to do a 1½ 8-point roll. This requires a lot of distance, and that makes the maneuver very tall. It helps to have a faster roll rate so the vertical lines don't become too tall. This applies to the up and down lines. Give yourself plenty of altitude to complete a complicated down line. Remember, your plane will accelerate—even at idle!

A common misconception is that an aft center of gravity (CG) helps snap rolls, but actually, a forward CG helps the snap roll. Of course, an aft CG helps in 3D moves, so you will have to find a compromise that best suits your flying style. Last, use the fastest servo you can afford. Believe me, servo speed helps here.

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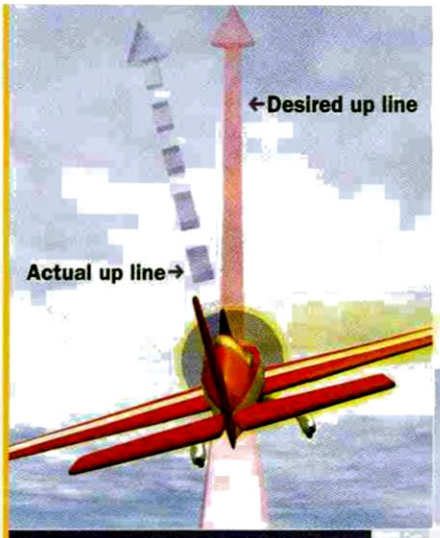
VARIETY: THE SPICE OF LIFE

OK; now that we have the basics behind us, let's look at a few variations. One basic variation is the direction or position of the exit point. The exit can be in the same track as the entrance, or it can be offset (see Figure 4). It can be in the opposite direction (180 degrees), or it can be at 90 degrees (left or right) to the entry. A reverse Humpty Bump starts from the top. Another interesting variation is one in which the vertical lines are tilted 45 degrees as shown in Figure 5. Remember, all kinds of rolls, partial rolls, or snaps can be added to one or both vertical lines; this can add up to almost limitless combinations!



← FIGURE 2 If you enter the first ¼ loop with one wing low, the up line will not be vertical.

↓ FIGURE 3 To maintain a vertical up line with a crosswind, you have to compensate with rudder.

WHAT CAN GO WRONG?

THE SOONER YOU FIX MISTAKES, THE BETTER! The key here is to observe the smallest errors as quickly as possible, so the fix needed will be small. When you pull up for the first ¼ loop, you must have your wings level. If one wing is low (even just a bit), the vertical line will not be straight (see Figure 2). If you notice that the left wing is low, fix it right away with right aileron. You will also need to add right rudder to straighten the tilted vertical line. The earlier you see the problem and fix it, the more subtle the necessary correction can be. A well-practiced correction makes an error invisible to observers on the ground. This takes a lot of practice to really do well.

CROSSWIND COMPENSATION

I could write a book on this alone, but for now, here are a few pointers that seem most meaningful to the Humpty Bump. In FAI aerobatics, we are allowed to fully compensate for a crosswind; in some IMAC-style competitions, there are some restrictions. Check the rules.

"Track" is the actual path of the aircraft, and "heading" is the direction in which the aircraft points. If there is any crosswind, your model's heading must point into the wind to some degree to compensate for it and fly the correct track (see Figure 3). Once you have the correct heading for the crosswind, when you pull into the first ¼ loop, two other things will go wrong! You'll have to roll the wings a bit to get back into the proper position, and you will have to adjust rudder for the correct angle to compensate for the wind.

Here are some hints. When making a rudder correction in a vertical line with a half roll, remove the rudder input as you roll. If you leave rudder in during the roll, the aircraft will corkscrew badly.

Also, when the half roll is completed, you'll have to add the same amount of rudder again but in the opposite direction. This is because rudder input reverses. During a full roll, the same amount of rudder correction in the same direction is required at the end of the roll. The trick here is to apply the rudder changes smoothly.

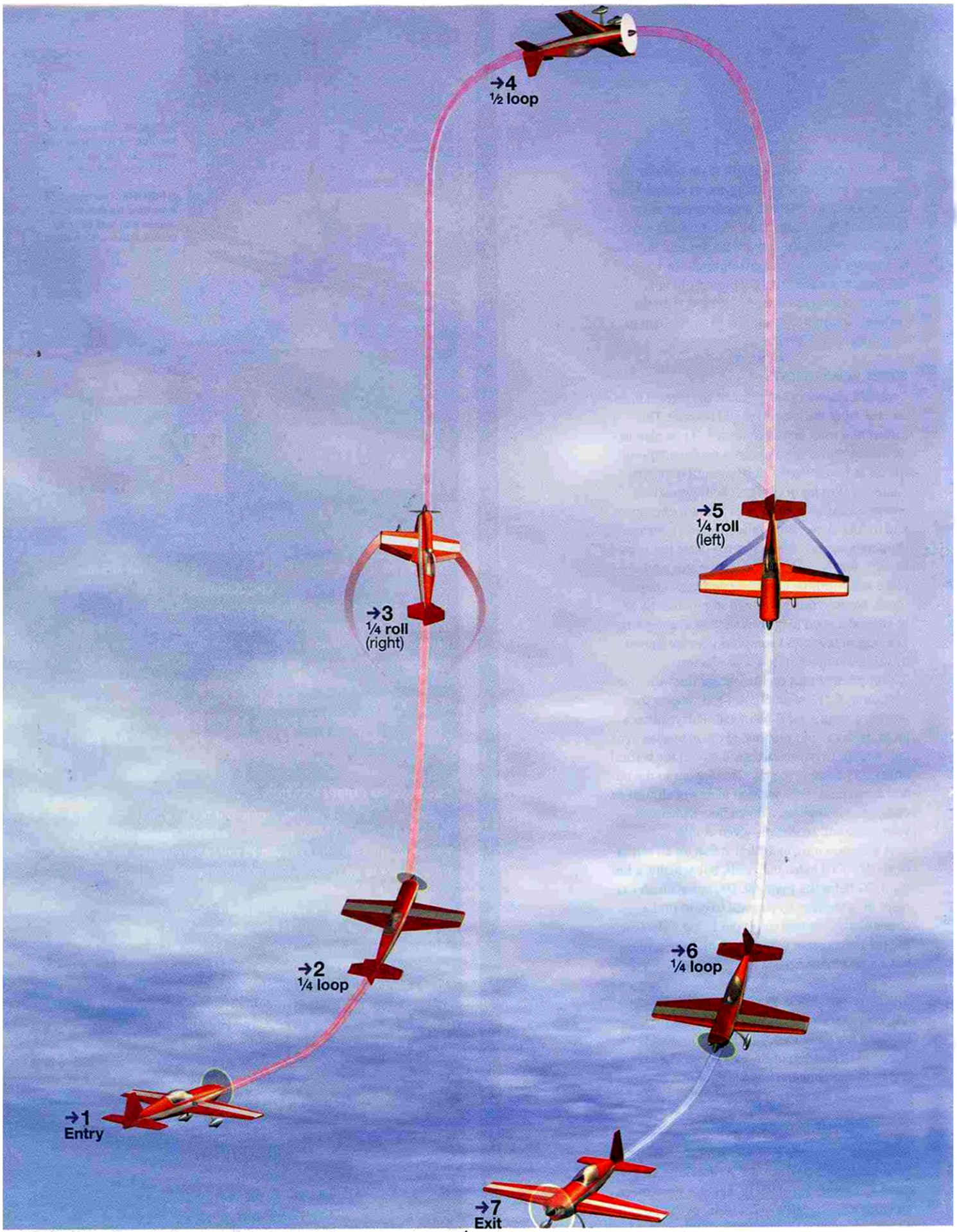
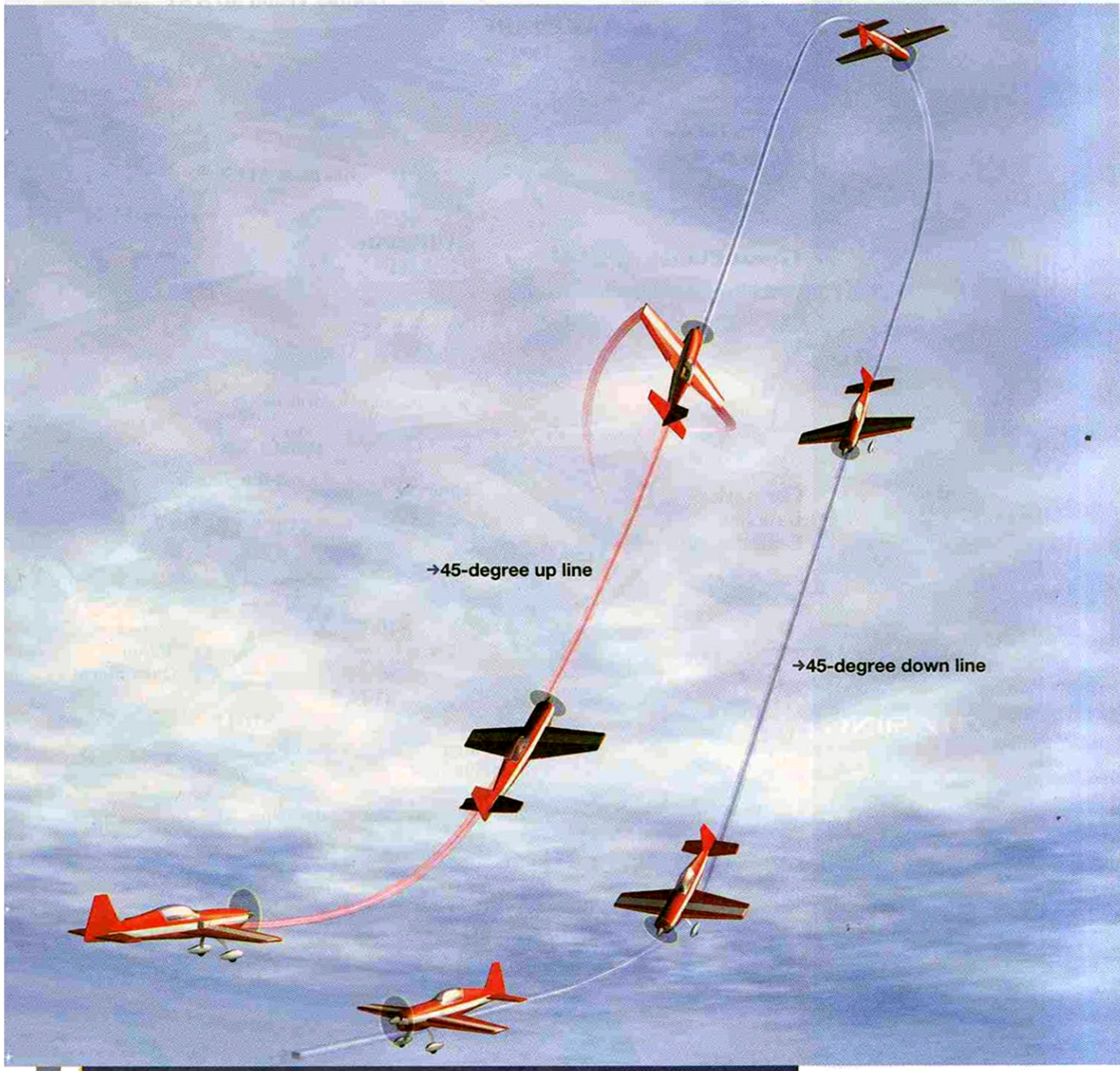


FIGURE 4 HUMPTY BUMP WITH ¼ ROLLS

FIGURE 5 HUMPTY BUMP WITH 45-DEGREE VERTICAL LINES



COMPETITION DO'S AND DON'TS

1. In competition, your exit altitude may be different from your entry, but the track should always be same. Check the rules; some competitions may require that they have the same heading.

2. All loop radiuses must be the same. A ¼ and a ½ loop must have the same radius unless noted. Airspeed is fastest at the first and last ¼ loops, and the top ½ loop has the slowest airspeed. Pilots often make the top loop smaller; it's very difficult for the pilot to observe. A good caller really helps here!

3. Rolls must be done at the midpoint of the straight-line segments. Mistakes are very easy for a judge to spot and easy for you to fix.

4. Position or placement of a bump is easy to judge, so plan the maneuver carefully in your mind before you start.

5. Finish clean. Look solid, and always be in control.

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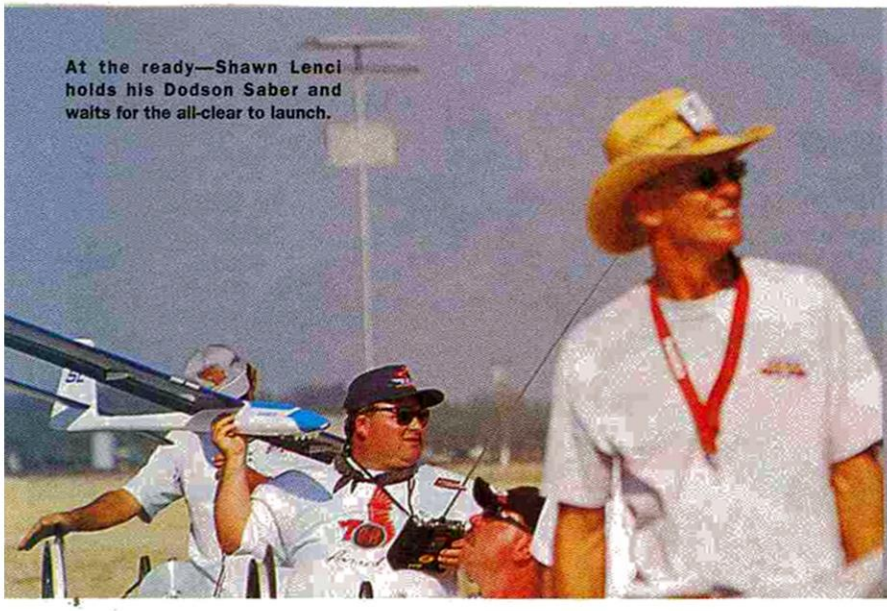
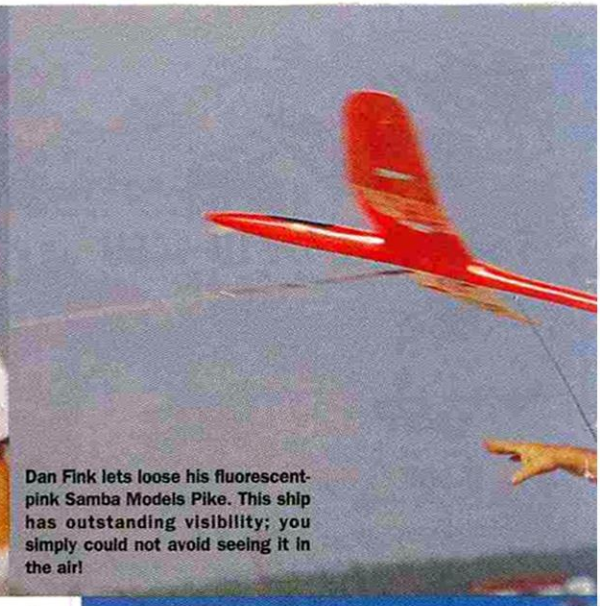
CONCLUSION

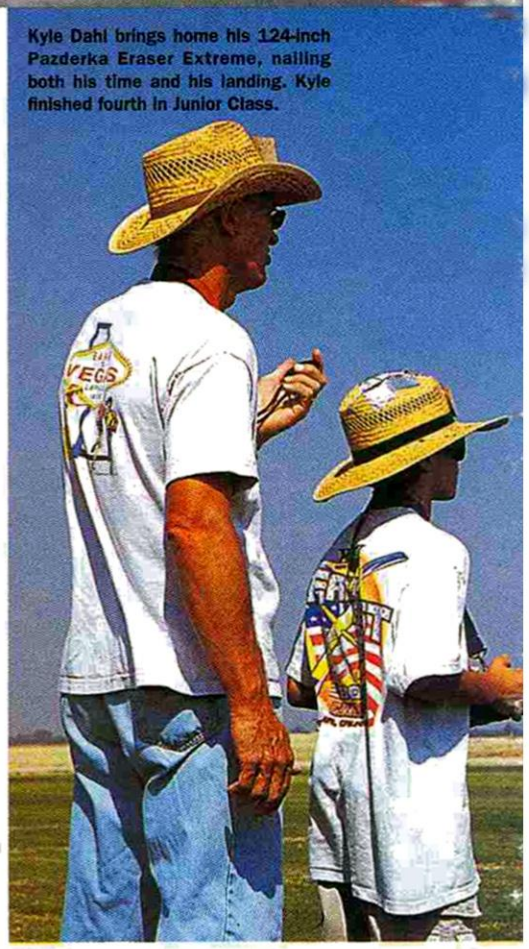
Remember, start with a simple bump, and then add complexity so you're more challenged as you become more comfortable. And as always, fly safely!



At the ready—Shawn Lenci holds his Dodson Saber and waits for the all-clear to launch.



Dan Fink lets loose his fluorescent-pink Samba Models Pike. This ship has outstanding visibility; you simply could not avoid seeing it in the air!



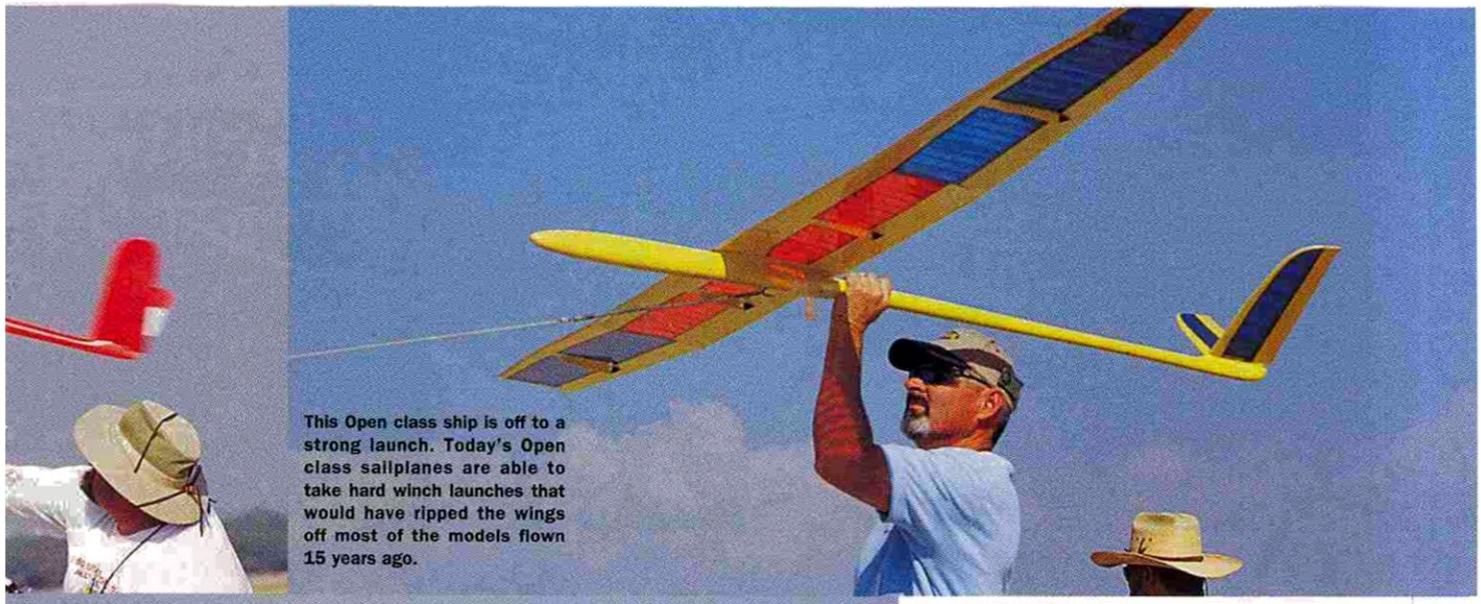
Kyle Dahl brings home his 124-inch Pazderka Eraser Extreme, nailing both his time and his landing. Kyle finished fourth in Junior Class.

Vista SOARING FESTIVAL

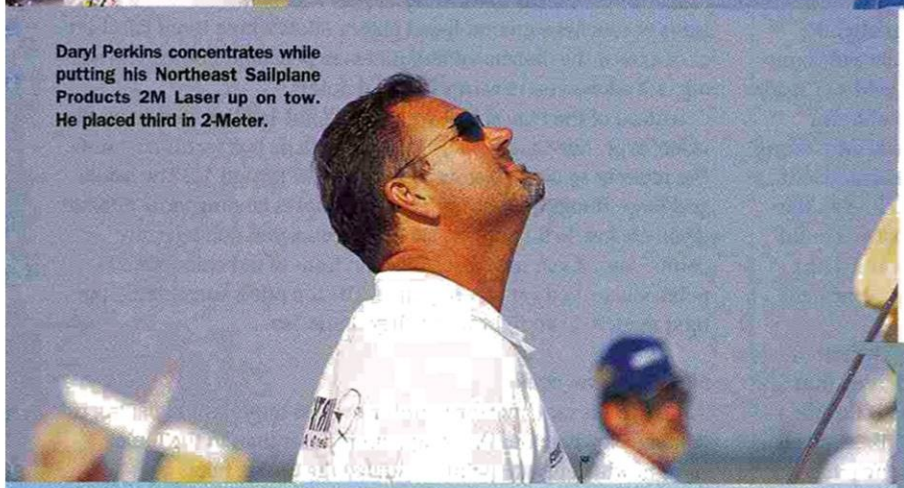
WHERE SILENCE IS GOLDEN

BY GREGORY VASGERDSIAN

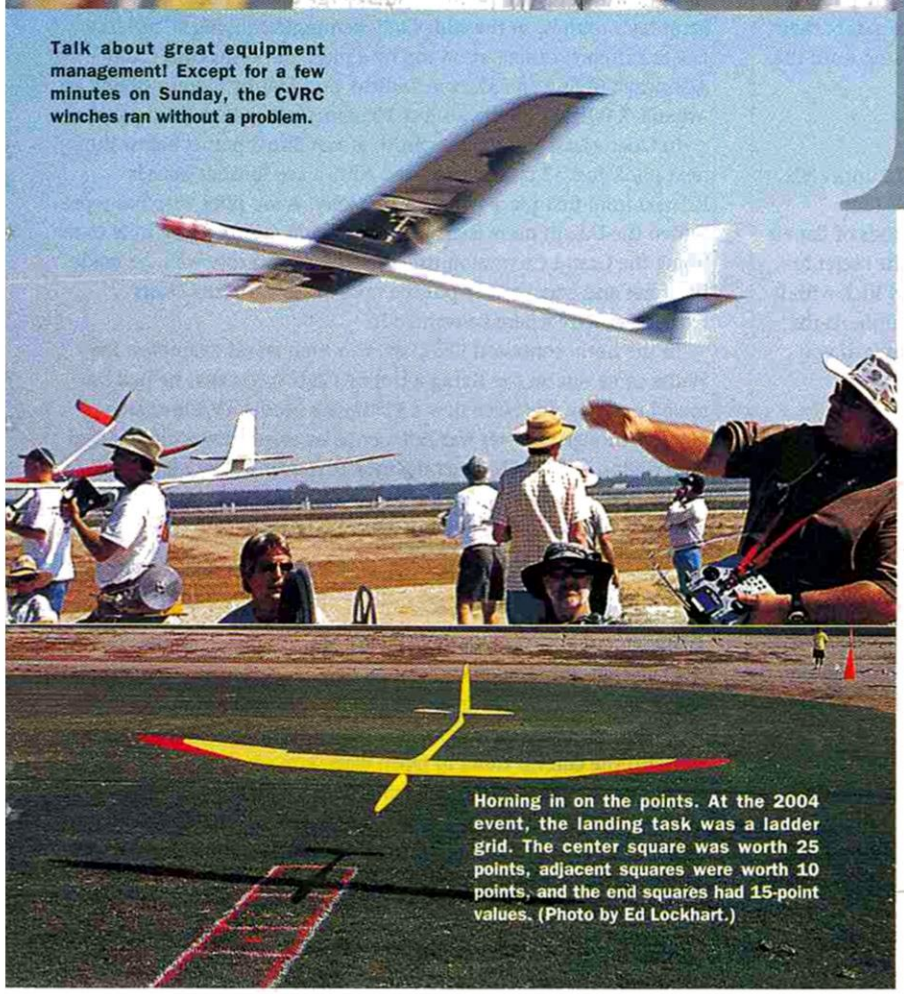
PHOTOS BY GREGORY VASGERDSIAN



This Open class ship is off to a strong launch. Today's Open class sailplanes are able to take hard winch launches that would have ripped the wings off most of the models flown 15 years ago.



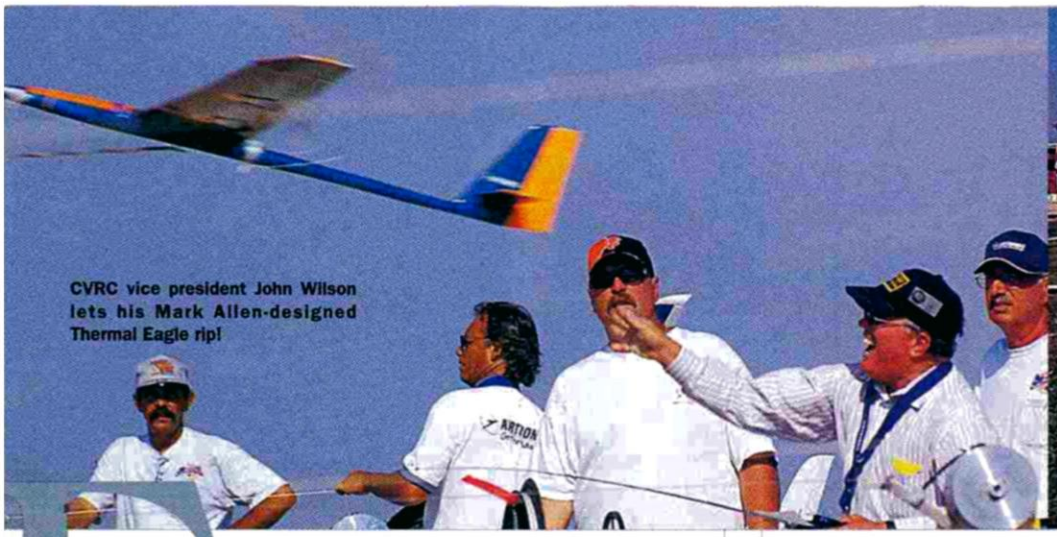
Daryl Perkins concentrates while putting his Northeast Sailplane Products 2M Laser up on tow. He placed third in 2-Meter.



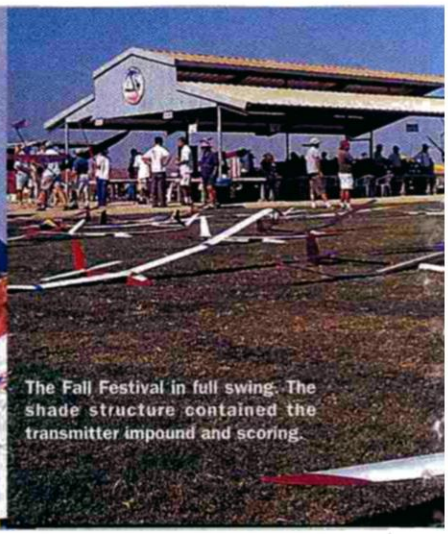
Talk about great equipment management! Except for a few minutes on Sunday, the CVRC winches ran without a problem.

Horning in on the points. At the 2004 event, the landing task was a ladder grid. The center square was worth 25 points, adjacent squares were worth 10 points, and the end squares had 15-point values. (Photo by Ed Lockhart.)

More than 20 long-wing sailplanes simultaneously spiraled high into the sky as pilots dotted the field at the 31st Annual Visalia Fall Soaring Festival last October. With 257 pilots competing in five classes, the winches were winding and the retrievers spooling as sailplane after sailplane took to the sky.



CVRC vice president John Wilson lets his Mark Allen-designed Thermal Eagle rip!



The Fall Festival in full swing. The shade structure contained the transmitter impound and scoring.

For soaring enthusiasts, the Fall Festival is a yearly "must-attend" event, at which old friends reunite, new friends are made and countless pilots have a great weekend of hooking thermals. As Mike Clancy of Novato, CA, said, "I come every year, and regardless of how I place, I always have a great a time!" The Central Valley Radio Control (CVRC) club flying site in Visalia, CA, was ready for the crowd with thick, 3-inch-deep grass across the large flying site—heck, even the cars were parked on it! By Saturday morning, the festival was in full swing with a parking lot full of cars, RVs, pitched tents and a nice vendors' row. Even the transmitter impound under the permanent shade structure was filled; the festival was on!

Veteran pilots know that the event will be loaded with multiple rounds of thermal-duration flying against top fliers not only from the U.S. but also from around the world. And, into the mix is thrown a great Saturday night BBQ, electric flying-wing races, "Stik" combat, nighttime flying antics and a big raffle. After the morning pilots' meetings, the calls were fast and furious for entrants to gather their sailplanes and radios and launch. The winches didn't stop until the end of the day on Sunday.

Conditions

For the 2004 event, pleasant temperatures in the mid to upper 80s with little wind and plenty of strong thermals were ideal for Saturday's longer flight tasks, but on Sunday, brief periods of flat air skunked more than a few pilots. In these conditions, the secret to getting your time was to aggressively search for lift and stick with it (something the top pilots were able to do time and again!). As the saying goes, "If you fly far enough, you'll hit lift"—that is, if you don't run out of air, and that can mean a long walk!

The classes

The festival was divided into Open class, 2-Meter, RES (rudder, elevator, spoiler), Junior and Gray Cup (highest score for pilots at least 62 years old). In addition, there was the overall competition title and the Middle-of-the-Pack winner, who took home a nice JR XP9303 radio! When an event fields this many pilots, anyone who makes it into the top 40 should feel on top of his game. Although attendance was down slightly from the previous year, Open class had 175 pilots and the popular RES class had a strong turnout of 60 competitors. RES is now the second most popular class in soaring.

The tasks

Over the years, the flight tasks at the Fall Festival have remained about the same. Saturday's rounds were 3, 5, 8 and 7 minutes long, while Sunday's were 4, 6 and 5 minutes. The time starts from the moment the sailplane is released from the tow and stops when it lands or touches a ground-based object. Pilots whose times fall short of or exceed the designated task times are penalized points. The landing task allows you to earn additional points.

Instead of the typical bull's-eye design, the landing task featured a ladder-type, five-square grid. The center square was worth 25 points, the adjacent squares 10 and the farthest end squares 15. The ladder grid keeps things interesting, but it also makes landing more difficult; if you are just ¼ inch to one side of the grid, you don't get any points. And, if you land just ¼ inch in front of or behind the 25-point square, you get just 10 points! The top pilots consistently put their models down right where they wanted to!

In the winners' circle

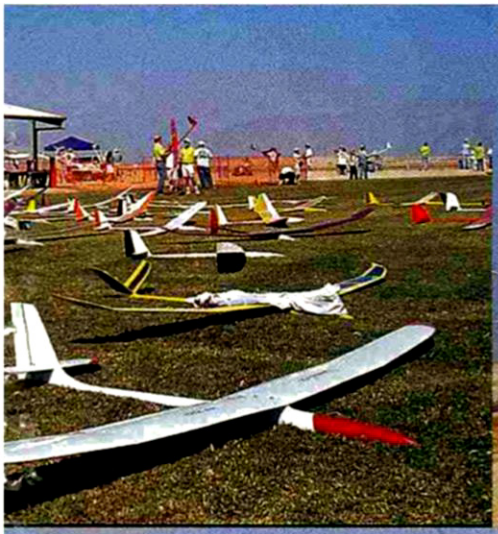
To stay in the race, making your time was as important as nailing the landing. Nowhere was the competition closer than in the Junior class, in which just 18 points separated the top six pilots after Saturday's rounds. In the end, Cody Remington (flying a Pazderka Eraser Extreme) came out on top by a mere 18 points over Casey Adamczyk (flying an F3X.com Zenith), and Manny Gomez (flying an Artemis XTail) finished with just 10 points less to take third place.

In Open class, many pilots finished just 2 to 3 points below the next pilot. Just 52 points separated 10th-place finisher Martin Falarski from first-place winner Larry Jolly! A top pilot who has represented the U.S. in more than a few FAI world events, Larry Jolly took home the Grand Champion title. He flew remarkably well; he made his times and consistently put the nose of his Pazderka Eraser Extreme exactly where he wanted it.

In the hotly contested RES class, two-time world champion Joe Wurts came out on top flying a Hobby Club Topaz that he had borrowed that day. Joe Nave flew a Vladimir's Model AVA into second place. Although 2-Meter was not a popular event, it was close; Edgar Vera (flying an FVK 2M Organic) took first over Bobby McGowan (flying a MapleLeaf Designs Image) by 37 points while four-time world champion Daryl Perkins (flying a Northeast Sailplane Products 2M Laser) took third.

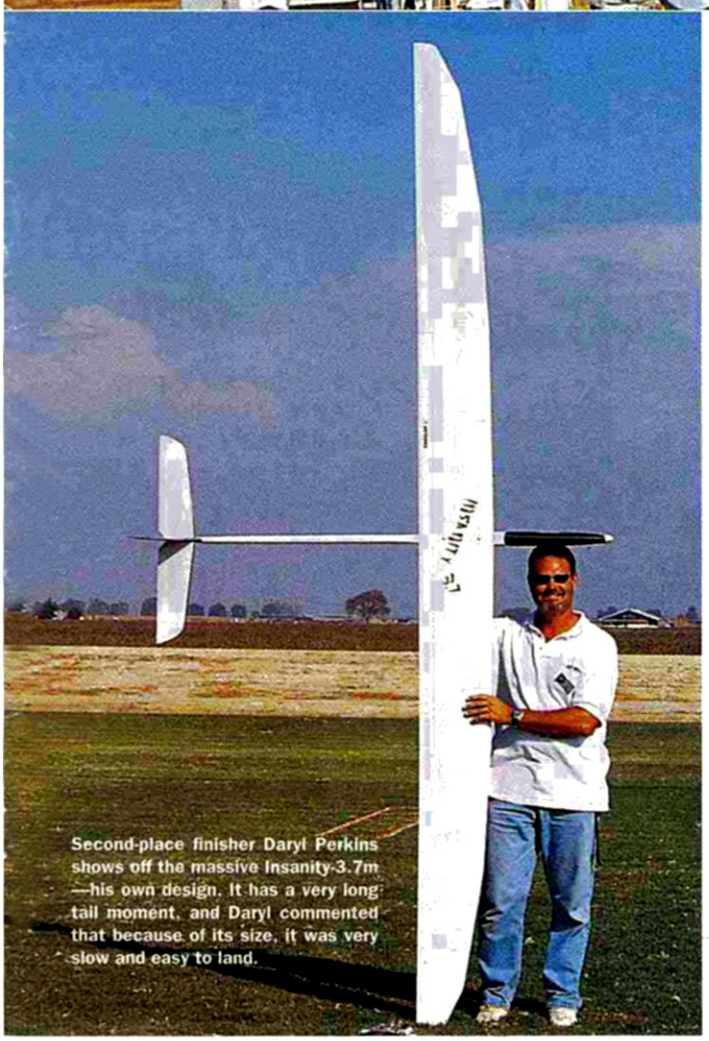
Top sailplanes

Although few new designs were flown, many existing models had been refined. The cross-section of models at the festival was phenomenal and, although today's molded sailplanes tend to look a lot alike, they vary according to wingspan, airfoil, tail moment and weight. But with the current trend in Open class, you are likely to be flying a glider made entirely of molded composite that has a wingspan of more than 120 inches and 6 servos. These planes are designed to handle the stress of a full-pedal winch launch, all the way up and over the top. Models such as the MapleLeaf Designs Icon, Samba



Second-place finisher in RES, Joe Nave puts his composite Vladimir's Model AVA up.

On the flight line, Lex Mierop launches his NYX in Open class.



Second-place finisher Daryl Perkins shows off the massive Insanity-3.7m —his own design. It has a very long tail moment, and Daryl commented that because of its size, it was very slow and easy to land.

Models Pike Superior, Jaro Muller Esprit, Pazderka Eraser, ACME Models Tempest, Tragi Ltd. Tragi 704, Northeast Sailplane Psyko and the Czech-made Hera are just a few of the crowd favorites.

World champion Daryl Perkins flew a new original design called Insanity-3.7M that was stunningly large and really pushed the current thinking on long-tail moments. Just as noticeable were a few big Harley Michaels' Genies, and there is certainly a trend toward ships with wingspans of nearly 130 inches. Another surprise was seeing Alex Eremenko of the Ukraine with his newly developed Topaz-M. This model featured the high-tech, composite-built structure of the Topaz but in a 3.14-meter, full-house package with flaps and ailerons and a flying weight of just 50 ounces!

In RES, the AVA and Topaz were the models of choice, but half of the field still came armed with built-up "woodies" that included the MM Glidertech Marauder, the Pierce Paragon and the Dynaflite Bird of Time.

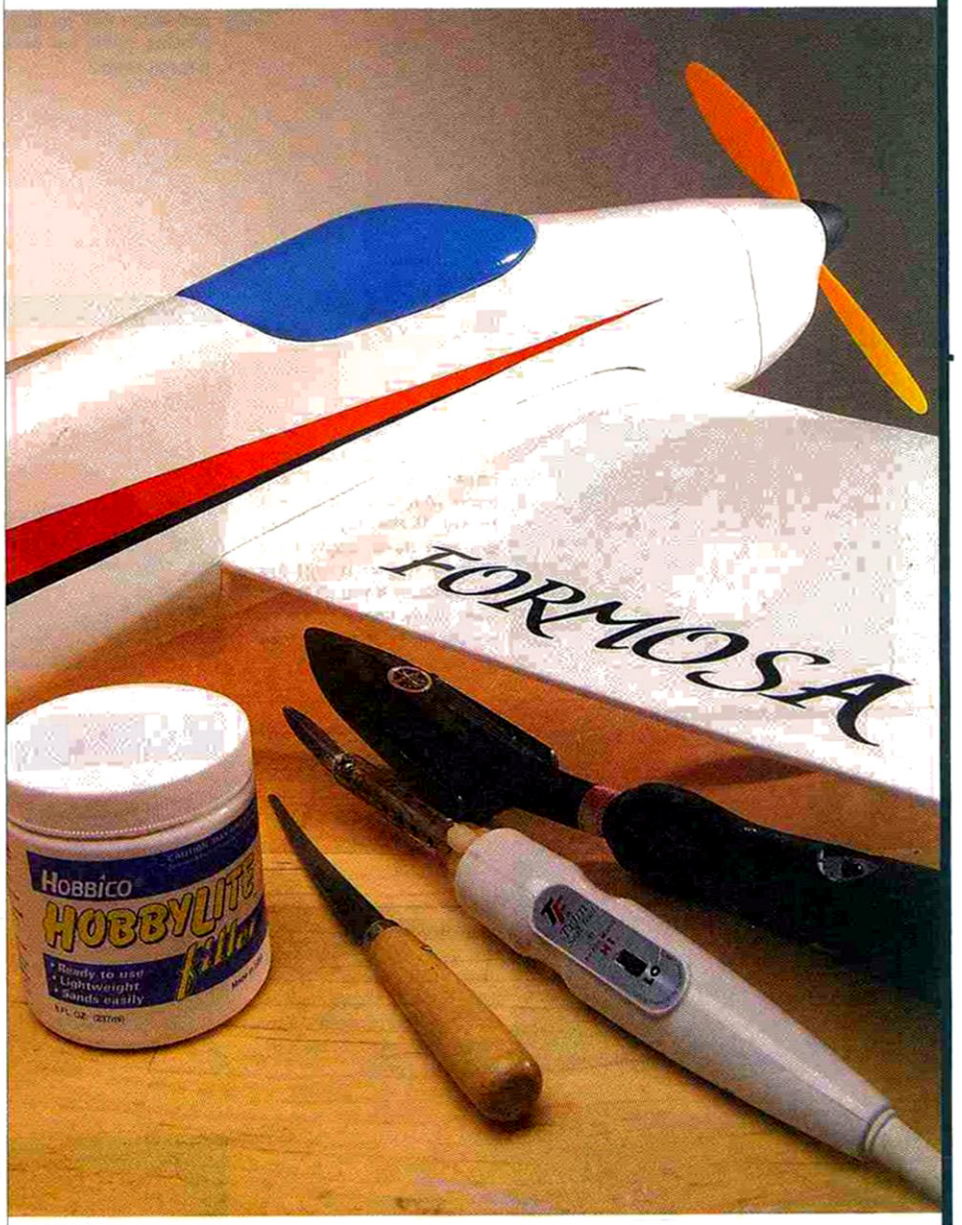
Kudos!

The current crop of sailplanes all fly so well that it is undisputed: the pilot—not the plane—really wins the contest! And that's what makes the Fall Festival so difficult to win: there are just so many great pilots in the fold. Still, when you ask anyone why they come to Visalia, the number one response is, "Fun!" Kudos to the CVRC club for another great fall festival. Look for its annual Bent Wing and Aerotow events later this year—not to mention the 32nd Annual Fall Festival October 1, 2005. For information on the CVRC club and a complete list of winners, visit its website at cvrcsoaring.com.

15 steps to cover foam

A SIMPLE TECHNIQUE THAT ADDS BEAUTY AND STRENGTH

BY RICK BELL PHOTOS BY RICK BELL & PETE HALL

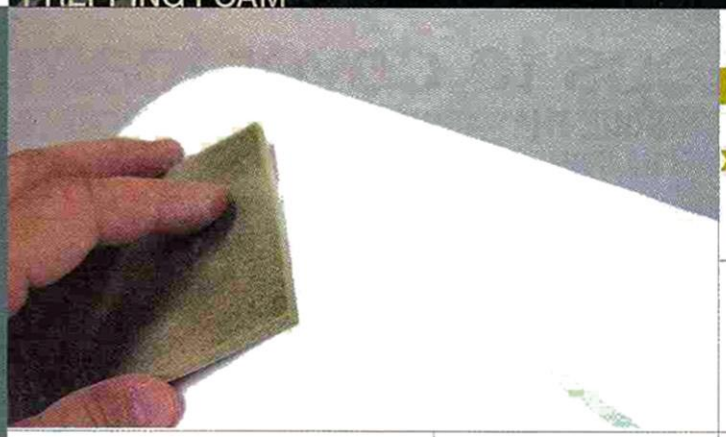


MOLDED-FOAM PLANES have a lot going for them: they're easy to assemble, very light and fly great. To me, though, they have one drawback: their finish. Foam often has a lot of pockets, injection-molding depressions, humps and bumps and a generally rough finish. I thought that I could improve the finish of a molded-foam model. After some trial and error, I came up with an easy foam-finishing method that adds very little weight, greatly improves the model's strength and produces spectacular results. For this article, I'll use a GWS Formosa, and I think you'll agree that the finished model is very impressive.

WHAT YOU'LL NEED

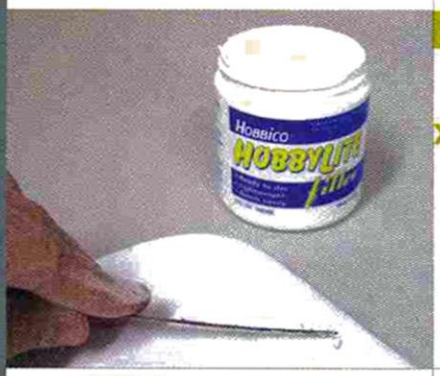
Before you start any project, you should assemble all the materials you'll need. I used Top Flite EconoKote (a low-temperature, heat-shrink plastic film), Hobbico HobbyLite lightweight filler, a Top Flite trim iron, a 21st Century covering iron and sanding pads of various grades.

PREPPING FOAM



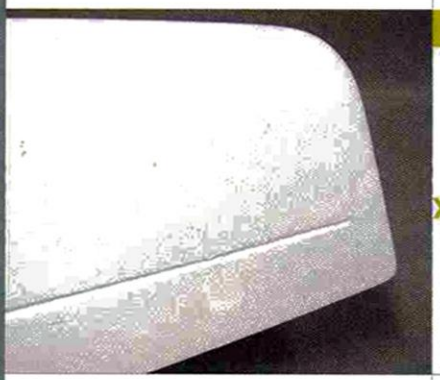
1

Sand off all of the major mold marks, and smooth the airframe. A medium-grit sanding pad works well for this. You can also use a sanding block, but be careful not to create any flat spots.



2

Using a spatula or similar tool, fill all of the deep imperfections in the airframe with filler and allow it to dry. If the depressions are very deep, apply filler several times; it will dry more quickly if you do it this way. Apply enough filler to ensure that it's higher than the surrounding surface.

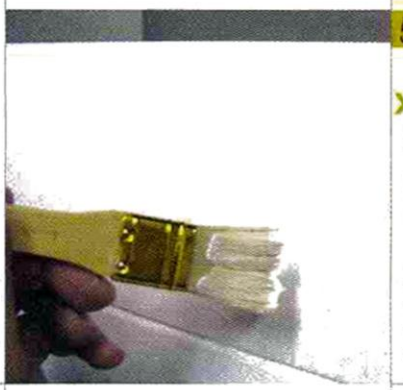


3

After the filler has dried, sand it until it's flush with the surrounding surface. Don't worry about it if the area filled is slightly lower than the surrounding surface; the next step will take care of that.

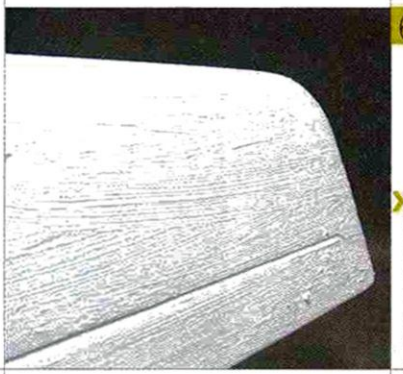
4

Thin the remaining filler with warm water. You want it to have the consistency of the meringue topping on a pie. Add only a little water at a time, and stir the filler thoroughly. Add water until you've achieved the proper consistency.



5

Use a brush of medium stiffness to apply the thinned filler to the entire airframe. Work the filler into every nook and cranny. Don't worry about being neat; you will sand off just about all of the filler. It's important to work the filler into the foam. Use a small dowel to remove filler from the hinge lines before it dries.



6

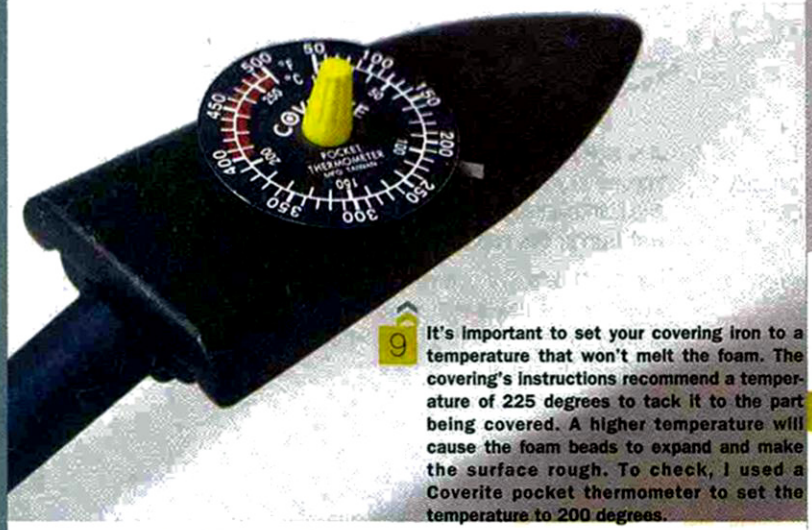
Here's the bottom of the wing with the filler applied. It looks like a thick coat of filler, but 99 percent of it will be sanded off in the next step. Note that the filler has been scraped out of the hinge line.

7

Here's where the transformation starts to take place: after the filler has completely dried, use a medium-grit sanding pad to sand it off. As you sand, you'll see all of those imperfections in the foam disappear. The goal is to make the airframe silky smooth. Be sure to wear a particle mask when you sand because the filler creates a fine dust that you don't want to inhale.

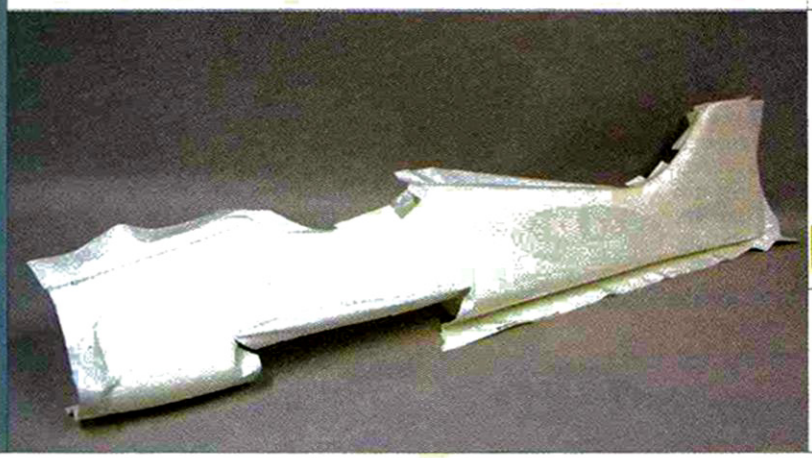
8 This before-and-after photo shows the dramatic difference between the untreated and the filled foam. At this point, the airframe was only 10 grams heavier.

At this stage, you could paint the foam and get good results, or you could take it a step further and cover the foam with a low-temperature heat-shrink film. There are many to choose from; I used Top Flite EconoKote because it's easy to work with and I like its high-gloss finish. In addition to providing a smooth finish, covering the model strengthens it tremendously.

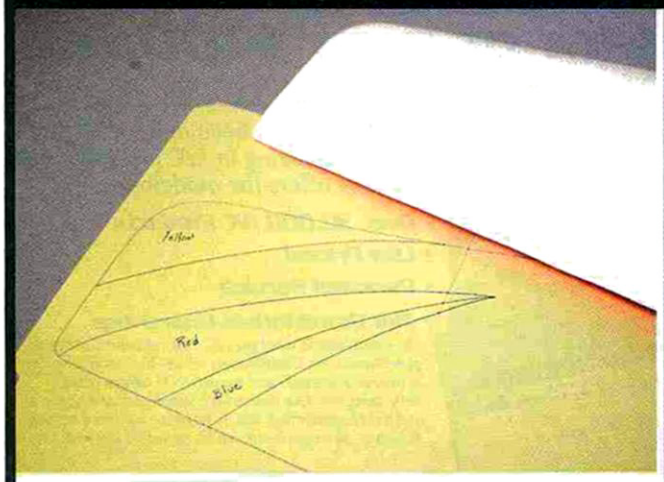


9 It's important to set your covering iron to a temperature that won't melt the foam. The covering's instructions recommend a temperature of 225 degrees to tack it to the part being covered. A higher temperature will cause the foam beads to expand and make the surface rough. To check, I used a Coverite pocket thermometer to set the temperature to 200 degrees.

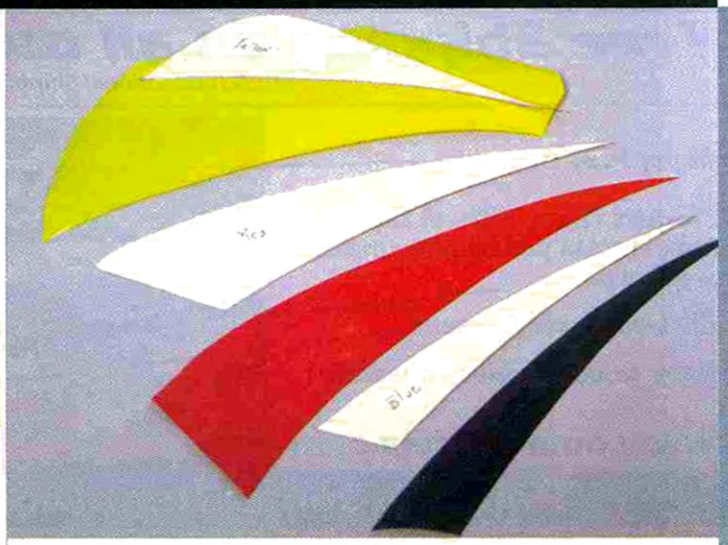
10 Covering a foam model is fairly straightforward and is similar to covering a balsa model. First, cover the bottom of the wing and stabilizer, and then cover the top and overlap the bottom covering at the seams. The EconoKote stretches well around curves such as wingtips.



11 I was able to cover the fuselage with only two pieces of material; the seams are on the top and bottom.



12 Plan your trim scheme before you cover the airframe. I like to use contrasting colors for the top and bottom of my models, so I used pink on the bottom of the wing and stabilizer and white for the rest of the model. I used red, blue and yellow to break up the white on the model. I traced around the airframe to make templates that I used to draw out the trim scheme. Large file folders are perfect for making the templates and then cutting patterns from them.



13 Use the patterns to cut the trim pieces out of EconoKote. Flip the patterns over to make left and right pieces.

14 Iron the trim pieces into place. A nice thing about the low heat setting is that as you iron the trim on, you'll have hardly any bubbles under the covering, and that means a really smooth finish.

15 After you've completed the covering, finish building the model by following the kit instructions. You can use this technique on virtually any molded-foam model with excellent results. Just remember to sand, sand and sand some more and to use a low heat setting. Have fun!

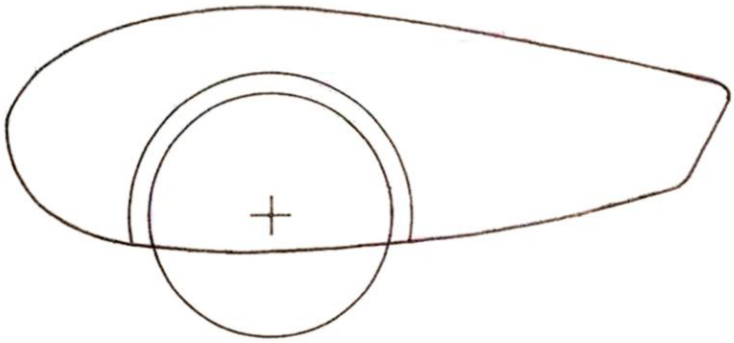
See the Source Guide on page 142 for manufacturers' contact information.

Design and build wheel pants

THE ART OF DRESSING UP

BY FAYE STILLEY > PHOTOS BY FAYE STILLEY & PETE HALL

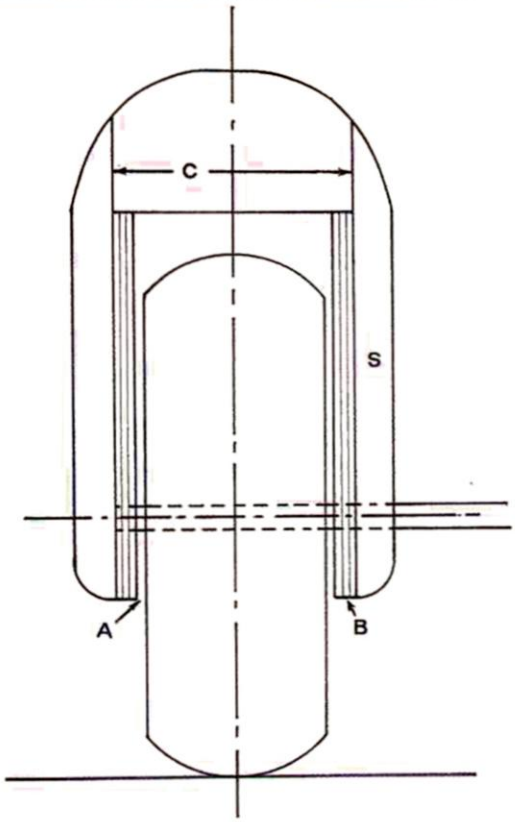
MANY ARFS AND KITS INCLUDE plastic or lightweight fiberglass wheel pants. They look great, but they typically don't last very long if you land on rough fields, or your landings are bumpy. Here is a simple way to make replacement wheel pants out of wood. This technique works equally well to dress up ordinary sport planes and to make wheel pants for a scale project.



1 »

Making templates

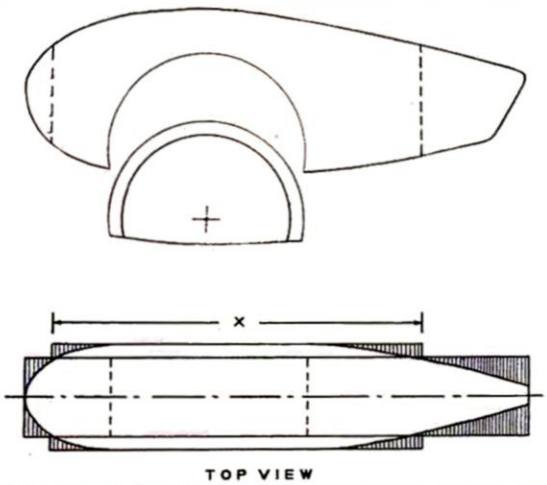
To make a full-size template, use poster board or lightweight cardboard. Trace the pant being replaced, or draw the shape you want. Locate the center of the wheel (where the axle will be), and draw a circle the diameter of the wheel being used. Then draw another circle at least ½ inch larger in diameter around the wheel. This larger circle represents the clearance needed inside the wheel well.



2 »

Determining the cross-section

This step takes longer to explain than it does to actually complete it. It is important, though, because it enables you to determine the minimum space needed inside the wheel well. Measure the width of the wheel you use, and draw a cross-section noting the axle centerline. Add clearance (A) to both sides of the wheel. This space may need to be wider on the inboard side of the pant to make room for mounting brackets. Now add the thickness of the wheel-well liners (B). (I use ⅛-inch-thick plywood, which strengthens the sides and provides a mounting surface for brackets or blind nuts.) The minimum thickness of the pant core (C) is determined by adding the width of the wheel, the two clearance spaces (A) and the two wheel-well liners (B). In this example, I used equal clearance spaces (A) of 1/16 inch and wheel-well liners (B) of ⅛ inch each. The wheel is 1 1/16 inches thick, so the pant core must be at least 1 1/16 inches thick. Typically, you have to laminate two or three pieces of balsa together to make the core, but I used a piece of 1½-inch-thick balsa. For the side pieces (S), the example shows ¼-inch-thick balsa; if you want a rounder pant, use thicker wood for the side pieces. You can also determine the required length of the axle by measuring the drawing or adding the thickness of the side piece to that of the core. Note that the axle does not go through both sides of the pant; it goes through only the plywood liner to provide support for the pant.



3 »

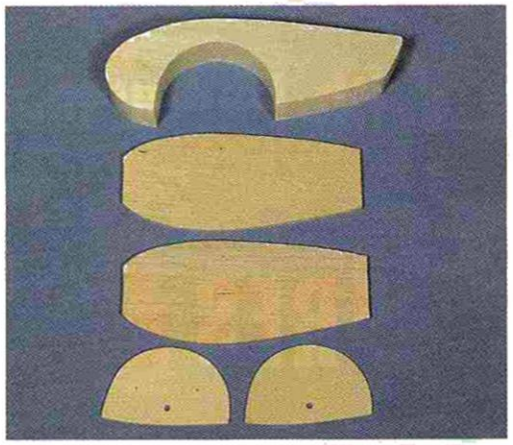
Sketching the top view

This is the last step before we get to the fun part; it will save some wood and a lot of work later. Make a full-size sketch of the top view of the pant. Draw rectangles to represent the core and the side pieces. Then draw the desired curves for the sides of the pant. Note that the side pieces don't have to be as long as the core. They need only be long enough to cover the area where the pants curve extends beyond the core. The points are shown on the drawing as the "X" measurement. The shaded areas indicate wood that will be cut away when the pant is shaped. Mark the "X" measurements on the template (dotted lines), and cut the template out around the perimeter and around the wheel well. Now we can start building.

4 »

Cutting the parts

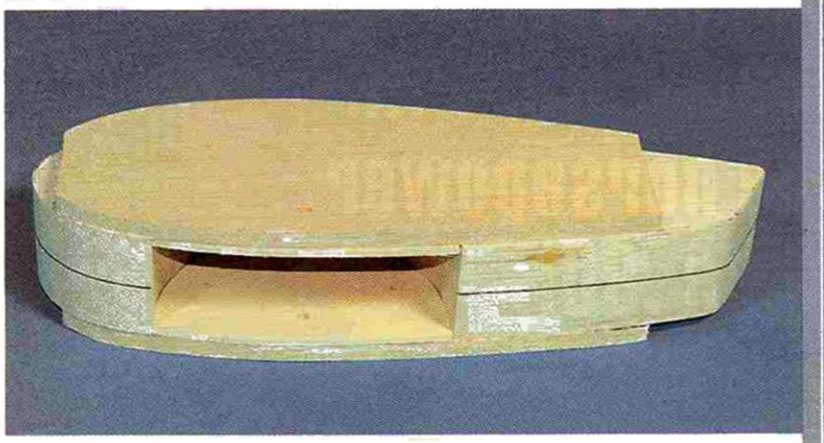
A wheel pant has only five parts: the balsa core, the two balsa sides and the two plywood wheel-well liners. Use the template with the wheel well removed when you draw the outline for the core section. Use the wheel-well template to draw the wheel-well liners, and mark the axle location. Then tape the wheel-well template into the pant template, and draw the outline for the sides using the dotted lines instead of the full core template. To get matching pieces, stack the wood for the side pieces together when you cut it. Do the same with the liners, and drill the axle hole before you separate them.

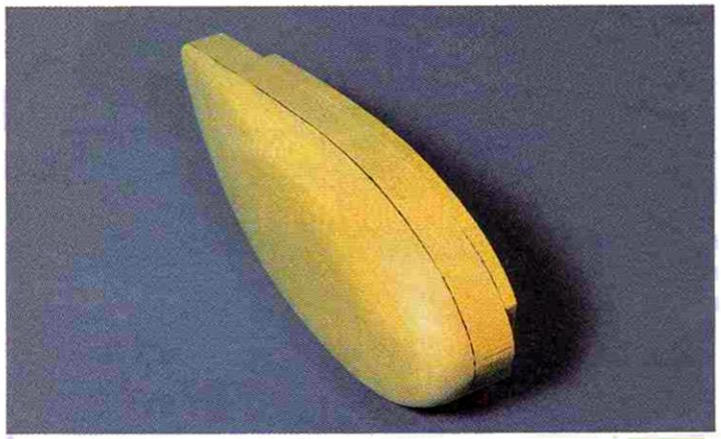


5 »

Assembling the parts

First make a "sandwich" of the core and the side pieces. White glue works best here because it is much easier to sand than other glues. Use clamps or heavy weights when you glue the parts together. Before putting the liners in place, locate the axle hole and drill it in the inboard side of the side piece. If you are making two pants, be sure to make a left and a right. Epoxy the plywood liners into the pant; be extra careful not to get any glue in the axle holes. The axle can be used to align the liners with the axle hole in the pant side. Don't leave the axle in the pant too long, and clean off any epoxy after you remove it. Draw a centerline around the core to guide you while shaping the pant.





6 »

Initial shaping

Shape one side of the pant to your satisfaction. As you do, you will see a "pattern" emerge where the side pieces are attached to the core. This pattern will help you shape the other side to match the first, while the centerline will help keep things straight.

7 »

Final shaping

After you have shaped the second side, coat the inside of the wheel well with epoxy or finishing resin, but avoid the axle holes. The epoxy provides fuel and waterproofing and reinforces the bond between the liners and the core. Attach the mounting hardware inside the pants, and they're ready for final sanding and finishing. Don't be caught flying without your pants! ✈

I'VE ALWAYS CONSIDERED A NEW ENGINE A GOOD EXCUSE TO DESIGN AND BUILD a new airplane, and I really wanted to try a turbine-powered aircraft. The Discovery Jet is definitely not a superfast, 200mph plane or a highly detailed scale job, but it is easy to build. I'm an old-fashioned model builder, and I like to work from plans, cut wood and make lots of sawdust. Would a turbine engine be compatible with this kind of thinking? I couldn't see why not. I wanted a basic airplane with a hint of jet styling for the budget-minded pilot.

DISCOVERY

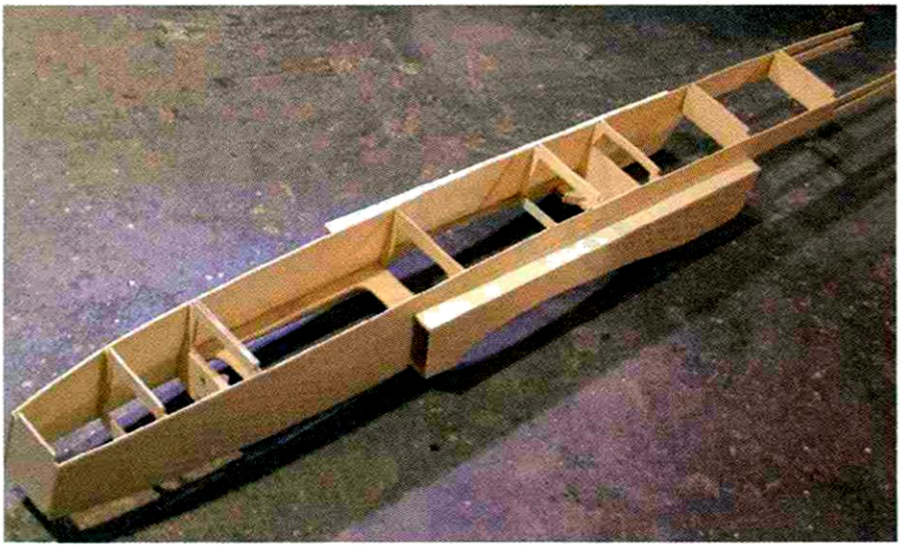
BY DICK SARPOLUS > PHOTOS BY DICK SARPOLUS & LOU MCGUIRE

Turbine-powered sport flyer

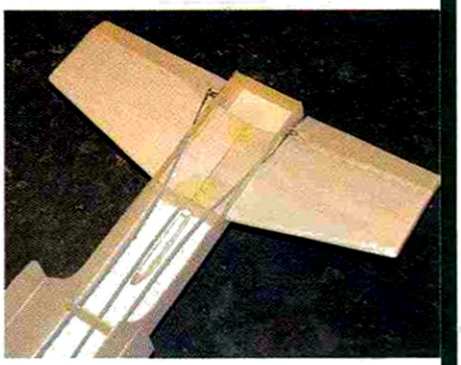
JET

SPECIFICATIONS

DISCOVERY JET
TYPE: turbine-powered sport aerobatic model
WINGSPAN: 82 in.
WING AREA: 1,370 sq. in.
WEIGHT: 19 to 20 lb.
WING LOADING: 34 oz./sq. ft. (at 20 lb.)
LENGTH: 75 in.
ENGINE REQ'D: 13 lb.-thrust turbine engine
ENGINE USED: SimJet 1200 AES
RADIO REQ'D: 5-channel (ailerons, elevator, flaps, rudder, throttle); retracts optional



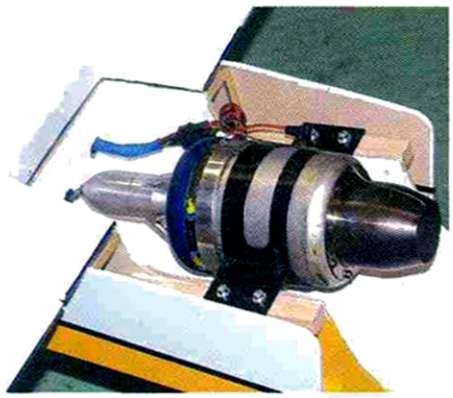
The basic fuselage structure is simple and easy to build. The outer intake nacelles have been added to the fuselage. They're strictly cosmetic!



Bottom view of the horizontal stabilizer glued into place with the flexible pushrod linkage to the two elevator surfaces installed.

Turbine engines are expensive, but I got around this problem by teaming up with my friend Bill Bailey. With his engine and my airframe, we would share the flying fun. The model has plenty of wing area and a fully symmetrical airfoil. After only three flights, I flew the prototype through rolls, loops, inverted passes, vertical climbs with rolls—you name it!—and it handled everything with ease. I estimate its speed to be just a little over 100mph.

For convenience, the turbine is attached out in the open—no tailpipe, engine hatches, or inlet ducts required. I placed the engine under the fuselage, so it would be hidden from view and close to the wing for balance. Because of the engine's position, I made the tail moment short and the nose long. I positioned as much of the gear as possible in the nose to counterbalance the engine weight. The simulated engine nacelles, air intakes and the anhedral in the horizontal stabilizer are all just for looks. I used fixed gear for simplicity and to lower building costs. You could easily install retracts without too much redesign. Wing flaps are incorporated, and although the plane can be flown without them, it isn't much work to install them.

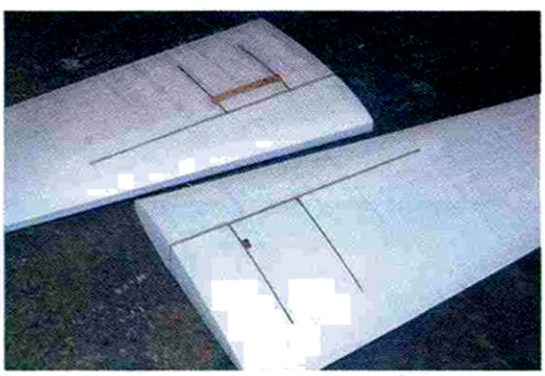


Here, the turbine mount has been installed and the SimJet 1200 AES clamped into place. At first, we used a single-strut engine mounting, but we later switched to this better strap-mounting system.

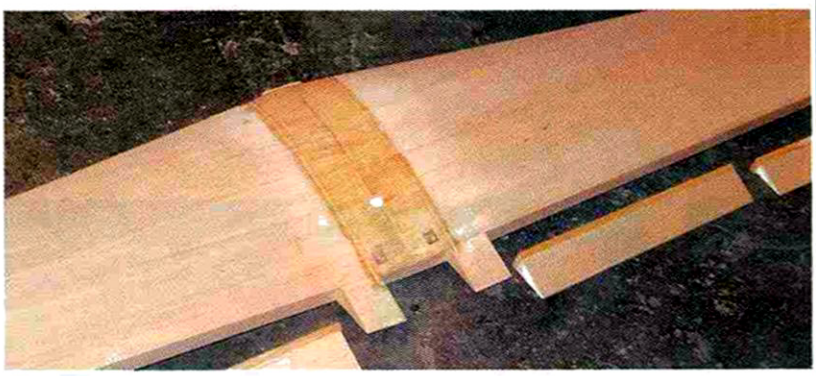
A SimJet 1200 AES turbine provides 13 pounds of thrust, and we're very pleased with it. The second test model weighed 20 pounds dry; it may be a little on the heavy side, but it flies very well, and it's definitely rugged.

CONSTRUCTION

The foam-core wing halves go together quickly and easily. The tail surfaces also have foam-cores with balsa sheeting. I used plywood for the fuselage construction; with that long nose moment, I thought plywood would be necessary for adequate strength. Lite-ply is used where strength isn't an issue. Any scratch-builder who is experienced with large aerobatic or scale aircraft could probably just look at the plans and start cutting out the parts for assembly. I made paper templates, traced around them on the wood,



The two foam-core wing panels are ready to be sheeted. The plywood spars, plywood ribs and landing-gear blocks have been epoxied into the foam.



The completed wing: the halves have been joined with glass cloth and epoxy, and the flaps and aileron sections have been cut free of the wing and partially finished.

With the wing removed, you can see the rudder and elevator servos as well as the main 50-ounce fuel tank. A second tank can be added in front of the main tank.

With the fuselage top hatch removed, you have full access to the onboard gear. Two screws hold the hatch cover in place.

and cut out the parts with a band saw. I cut my own foam-cores with a Nichrome wire bow powered by a variable-voltage transformer. The wingtip and root rib templates are shown on the plans.

Before you sheet the wing, you must epoxy a full-depth plywood spar into the inner part of the wing panels. Plywood ribs are also glued in to support the hardwood landing-gear blocks. Cut these ribs slightly oversize and trim them to fit. I installed the gear blocks so that they protrude from the foam-core surface, and then I cut the wing sheeting to fit flush around them.

To make the wing sheeting, edge-glue 3- or 4-inch-wide balsa strips together. I've been using Dave Brown Products Southern Sorghum contact cement to attach the sheeting to the foam. Before you join the wing halves, a tunnel must be melted through the cores for the aileron and flap servo extensions. After they've been sheeted, block-sand the cores' leading edges and glue ½-inch-thick balsa in place for the leading edge. Plane and sand the leading edge to shape. Measure and cut off the rear portion of the wing panels to form the ailerons and flaps; then glue the ⅜-inch balsa caps into place to support the hinging. Plane and sand the balsa flush with the wing surfaces. Shape the flaps' leading edges so they fit flush with the top of the wing, and hinge them near the bottom of the surface. The aileron leading edges are beveled and use centerline hinging.

Sheet the wingtips with ¼-inch balsa, and then glue a plywood rib to the root of a wing panel to accept the wing mounting tab. I sanded the ends of the cores for a good fit at the proper dihedral angle (1½ inches under each wingtip) and epoxied the panels together with the plywood joiner between them. I wrapped the wing joint with heavy fiberglass cloth and epoxy and scraped away the excess resin for a smooth job. Once the panels have been glued together, epoxy the mount tab into place.

The tail surfaces are flat, ⅜-inch-thick foam-cores. Cut the foam to shape, add the balsa edges and use contact cement to attach the 3/32-inch sheeting over the structures. Sand the edges to shape. Epoxy the two stabilizer halves together at the anhedral angle shown on the plans, and then reinforce the joint with a small strip of glass cloth and epoxy.

FUSELAGE ASSEMBLY

Because of their length, each side of the fuselage must be made from two pieces and then joined with a small plywood doubler at the wing saddle. With one fuselage side flat on the workbench, glue all the bulkheads into place at the wing saddle area. The other fuselage side can then be glued into place. The fuselage sides are parallel to each other from the wing's leading edge all the way to the end of the tail; that makes construction and parts alignment very easy. The ¼-inch ply bulkhead (F-3) that supports the nose gear and the ⅛-inch ply inner fuselage stiffener can now be installed. After the fuselage structure is properly aligned, the two remaining bulkheads (F-1 and F-2) can be added while you pull the front fuselage sides into place. Epoxy the plywood wing-bolt plate in place.

At this point, I fitted the fuselage to the wing and adjusted it so that the wing-mounting tab and the wing saddle fit properly. With the wing in place, drill through the wing into the wing-bolt plate. Enlarge the holes in the wing to fit the attachment bolts, and then thread the plywood plate with a ¼-20 tap.

The side-intake nacelles are used strictly for styling; fit them to the fuselage with the wing in place. Glue the horizontal stab into place, and align it with the wing. Glue the ⅜-inch balsa edge strips to the top edges of the fuselage, and then glue the lite-ply top sheeting into place. Before you glue the top sheeting into place, cut a slot for the vertical fin. Glue the nose block into place; carve and sand it to shape, and then glue the vertical fin into place.

TURBINE AND RADIO GEAR

The removable top fuselage hatch provides access to all of the onboard equipment, and it is held in place with two nylon bolts. You can install the main fuel tank (50-ounce) above the wing, and there is room for an additional 24-ounce tank just in front of the wing. The servos are mounted aft of the main fuel tank. I used well-braced, Sullivan 4-40 carbon-fiber pushrods for the elevators and rudder. After the pushrods have been installed, the fuselage's rear bottom lite-ply sheeting can be glued into place.

I bent the wire nose gear out of ¼-inch music wire and drilled out a standard nylon nose-gear bracket to fit the larger wire. I used a separate steering servo to control the nose gear. The ¼-inch main landing-gear wire

The completed airframe is pictured upside-down to show the fixed landing-gear installation. Retracts can be installed, if desired.

may seem to be overkill, but some of our early landings proved that they stand up very well.

TURBINE INSTALLATION

There's plenty of room for all of the onboard turbine equipment, and that includes the ECU, starter tanks, fuel pump, valves, etc. Install the batteries as far forward as possible, and add nose weight if needed to achieve the correct balance. If necessary, hollow out the bottom of the nose block to place the weight as far forward as possible.

To attach the turbine engine to the fuselage, I've used a pylon-mount assembly and a strap-style mount bolted to hardwood rails; I've found both types to be acceptable. To ensure correct flight trim, install your engine with a 10-degree positive angle. As a precaution, I installed a piece of thin aluminum on the bottom of the fuselage just above the turbine exhaust. With the 10 degrees of engine angle, however, you probably won't need the aluminum. On my second model, I applied BVM ceramic heat-shield paint to the bottom of the fuselage.

I like the military look of the first Discovery, but I admit that my covering job was done quickly, as I wanted to get the thing in the air. The good-looking MonoKote finish on the second model was done by Alan Delana who also handled much of the turbine-gear installation.

FLYING

Because of the Discovery's conservative design, I approached the test flights with little concern. To me, it looked as though it would be pretty easy to fly. The first model took off easily, but the plane tended to climb too much; I had to crank in down-elevator trim. As it turned out, I didn't get the engine-thrust angle right! When the throttle was reduced, the plane would quickly lose altitude, so the down-elevator trim had to be taken out.

Elevator control was also very sensitive. I changed the engine angle, and that completely solved the elevator-trim problem. The elevator-control sensitivity was fixed by moving the CG forward. The Discovery didn't have any tendency to snap or stall, but with its balance point moved to the location shown on the plans, elevator response improved greatly. The model now handles like a conventional sport aerobatic machine. Because of its size, Discovery is not excessively fast—exactly what I wanted! The plane is intended to be a sport flyer, not a high-speed record breaker. I hesitate to call it a "jet trainer," as it is not intended for a novice pilot. For those who want to gain experience with a turbine power system, Discovery would serve well as an introductory aircraft.

While flying, it is important to keep the engine's throttle-response lag in mind—particularly during takeoffs and landings. The model's generous wing area and easy-flying characteristics make it easier to manage the engine settings. Bill has flown the Discovery more than I have, and he has the landing procedure figured out; he uses the flaps for slow, nose-high touchdowns. I really enjoy aerobatic flying with this turbine-powered aircraft—a definite modeling thrill for me.

The AMA's pilot and airframe requirements for turbine-powered aircraft are available on its website (modelaircraft.org), and if you plan to build the Discovery, I urge you to understand and meet them. Additional information is available from the Jet Pilots Organization (jetpilots.org). If you have any questions, please don't hesitate to email me (rsarpolus2@comcast.net). If you aren't a scratch-builder, you'll be pleased to know that a kit is in the works. Check the U Fly Hobbies website (uflyhobbies.com) for further information.

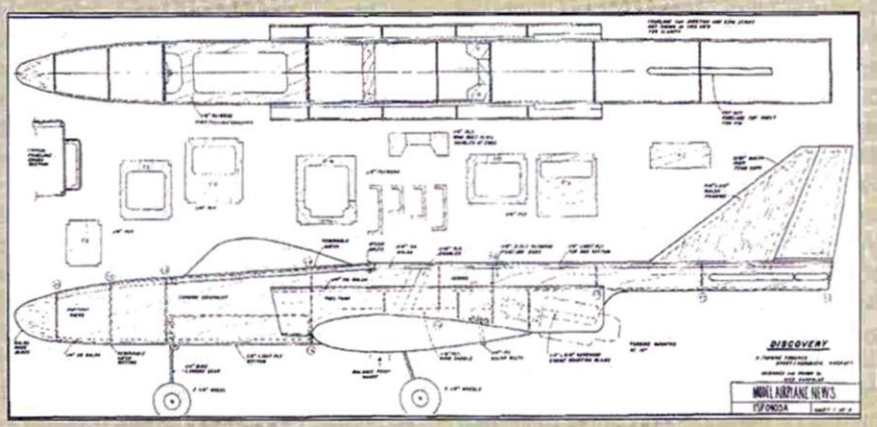
If you've ever wanted to investigate turbine power, give the Discovery a try. It will certainly ease your transition to jet jock!

See the Source Guide on page 142 for manufacturers' contact information.

COMMENTS

The Discovery Jet is capable of basic aerobatics, but it is intended as a starting point for modelers who want to get into turbine-powered flight. It isn't a superfast flying machine. The model has foam-core wing and tail surfaces and a plywood, lite-ply, and balsa fuselage construction. It has fixed landing gear, but retracts can be added.

DISCOVERY JET
FSP0405A



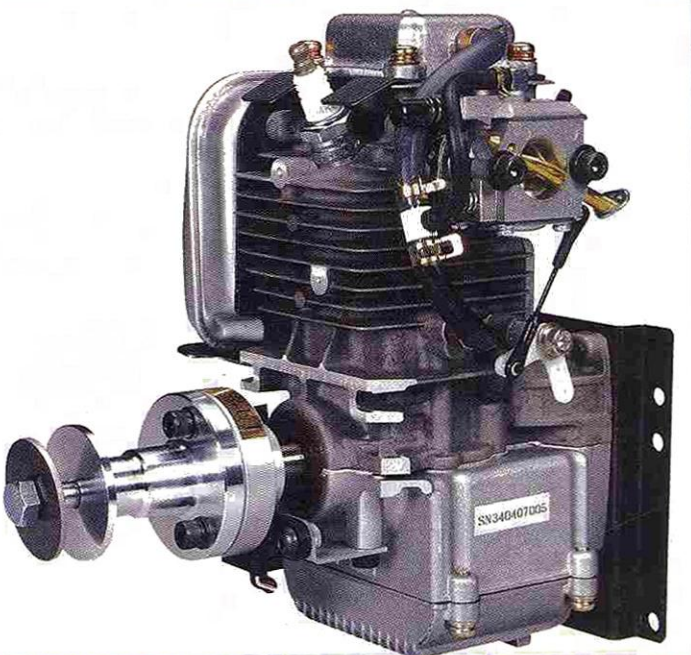
TO ORDER THE FULL-SIZE PLAN, VISIT RCSTORE.COM ONLINE.

4-STROKE GASOLINE ENGINES ARE HERE!

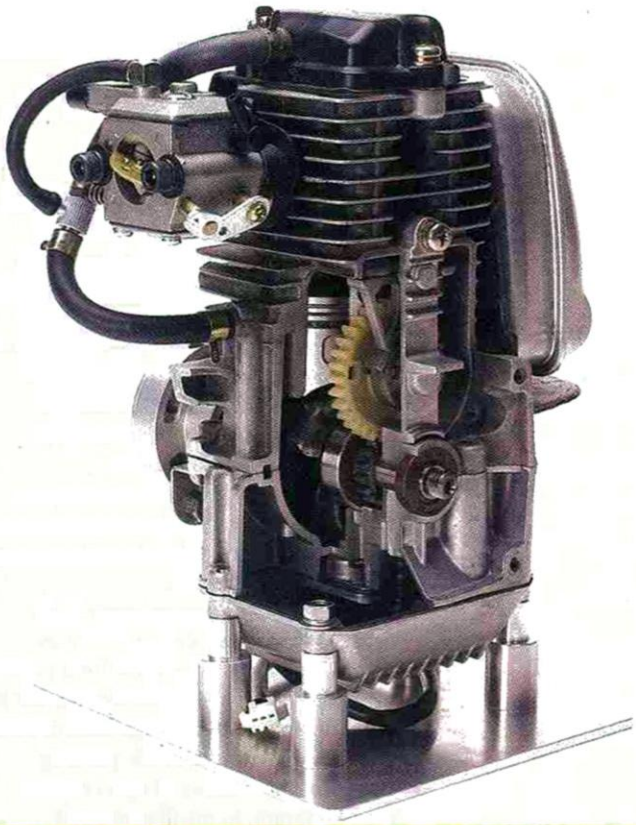
BY GERRY YARRISH > PHOTOS BY GERRY YARRISH & DERON NEBLETT

Greg Hahn and his caller, Susie Phillips, with their Fuji 34cc-powered Balsa USA Fokker D-VII. The new 4-stroke gas engine hauls the 20-pound, ¼-scale biplane around with power to spare.

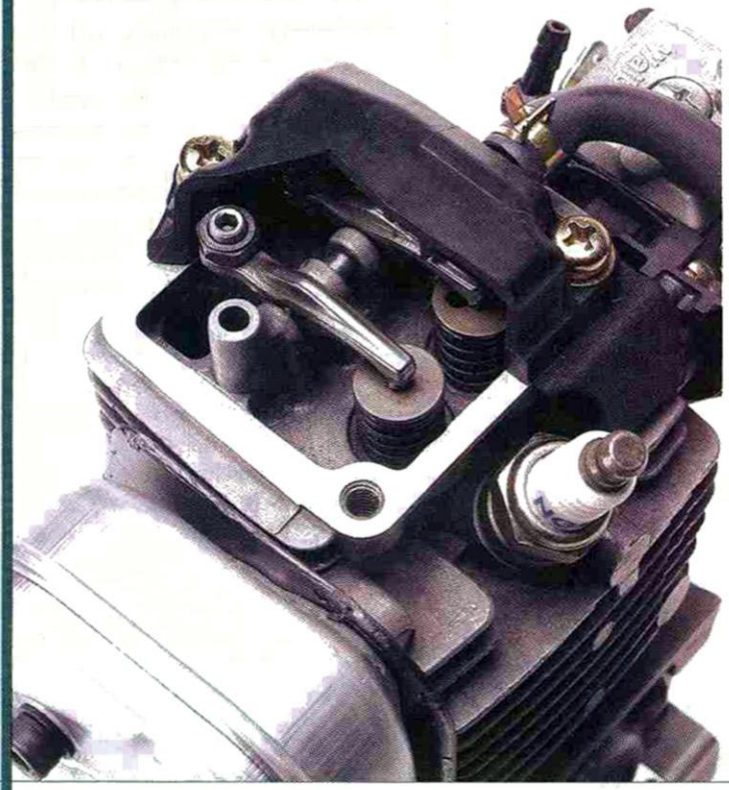
I BUMPED INTO MY GOOD BUDDY AND COMPETITOR Greg Hahn at the 2004 U.S. Scale Masters Championships in Gardener, KS. Besides flying his impressive C-47 Skytrain, Greg was also part of the noontime demo show, where he flew his Balsa USA ¼-scale Fokker D-VII. The most exciting part of Greg's demo wasn't his model, however, but rather the engine he used to power it! Greg had installed a new, prototype 43cc Fuji 4-stroke gasoline engine in it, and its performance was truly amazing! I was so intrigued that I had to learn everything I could about it and let all of our "Thinking Big" readers in on this secret!



The Fuji BF-34EI 4-stroke gas engine is a real powerhouse. It turns a 22x6-10 prop at 5,000rpm and is very easy to start.



Above: this close-up, cutaway view of the engine show its internal-valve drive train. Below: beneath the rocker cover, two sets of stout rocker arms, springs and valves take care of fuel delivery.



Distributed by Great Planes, the Fuji 4-stroke engine will be available by the time this column hits the newsstands. Actually, two Fuji 4-stroke engines will be available—a 25cc and the 34cc engine highlighted here.

The Fuji BF-25EI and BF-34EI are true 4-stroke gasoline-burning engines, and they have a "wet sump" oil system (oil in the crankcase). No more mixing oil with the fuel! Each has a dipstick for checking the oil level, and both come with an electronic-ignition system and a very efficient muffler. The engines are very quiet and meet demanding European noise-level standards. Each engine has an internal-valve drive train that runs off a common cam. As you can see from the photos of the demo-engine cross-section, the cam is driven by a nylon gear, and two walking beams transfer motion to the lifter rods. This internal arrangement keeps the engine's overall length to a minimum.

The 34cc engine develops a great deal of torque and will turn a relatively large prop for its displacement (Greg's demo engine easily turned a 22x6-10 Top Flite PowerPoint prop), and it takes the load without overheating. Other impressive features of the engine are its excellent fuel consumption (less than half that of a comparable 2-stroke engine), its electronic-ignition system (which ensures very easy starting) and a user-friendly Walbro carburetor. It also comes with a chrome-plated cylinder lining; a ball-bearing-supported, dynamically balanced flywheel; a crankshaft and prop-hub assembly; a Champion RCJ6Y resistor spark plug; and a 3.4-ounce bottle of ultra-low viscosity (0-W-20) oil.

The engine's spec sheet shows rpm of 1,400 at idle and a top end of about 9,000rpm max. Both engines require regular unleaded gasoline, an engine kill switch and a 4.8V battery pack for the ignition system.

According to Greg, after a bit of run time, the Fuji 34cc turns a Top Flite PowerPoint 22x6-10 at 5,000rpm—not too bad when you consider that a G-62 turns that same prop at 6,800, and it has almost twice the displacement! The PowerPoint 20x6-10 prop gets the rpm up to the 5,500 to 5,800 range, and an 18-inch prop delivers a little over 6,000rpm. Because 4-stroke engines aren't meant to be screamers, I don't think the Fuji engines need to operate at much more than 6,000 revs, anyway. Four-stroke engines are torque producers; that means they develop good power at low rpm—something that 2-stroke engines simply don't do.

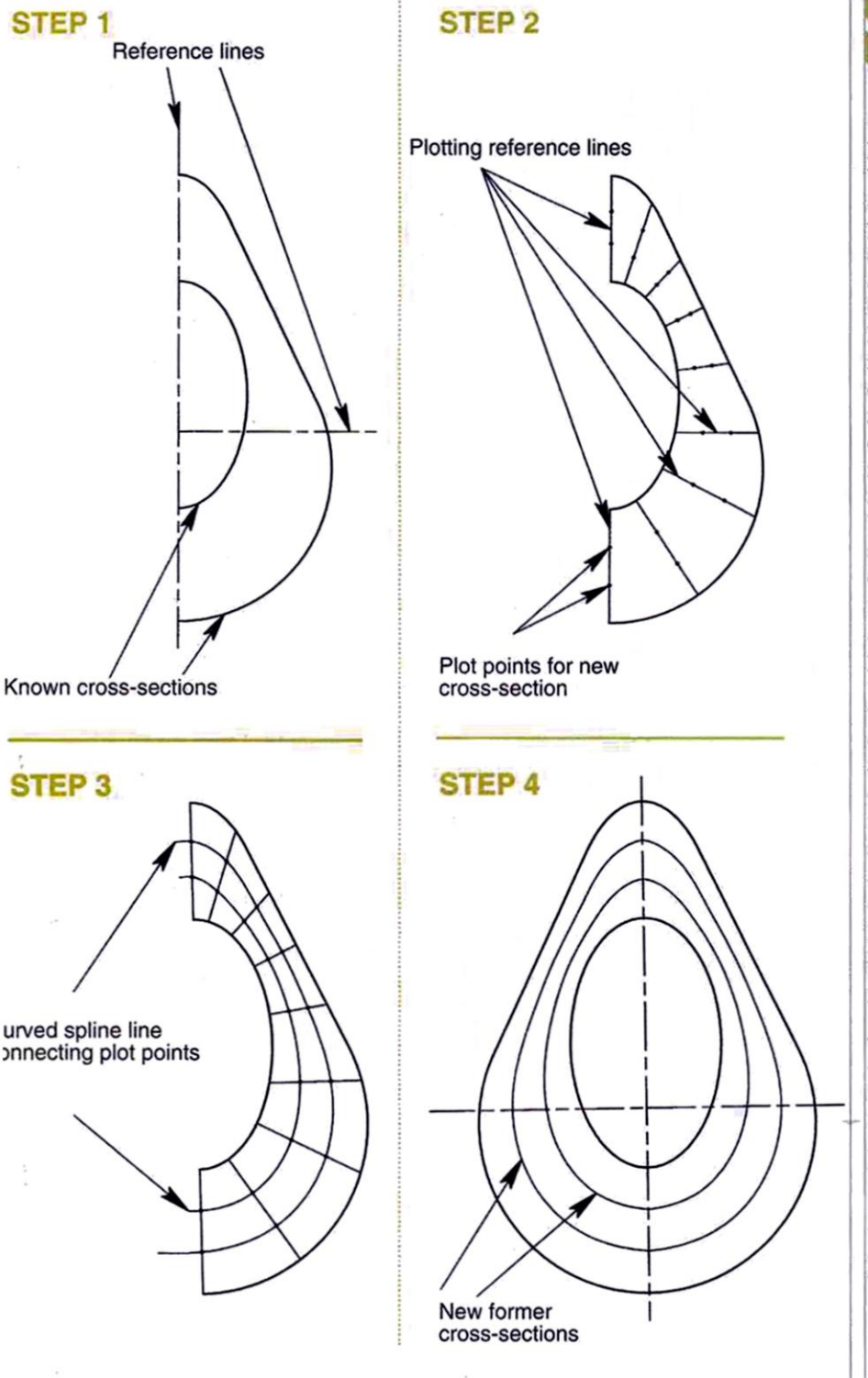
The street price of the BF-25EI 25cc engine is $859, and the BF-34EI 34cc engine costs $939.99. Keep your eyes peeled for a complete engine review in a future issue.

KELEO EXHAUST SYSTEMS

Anyone involved in giant-scale models knows that good-quality exhaust systems can make a big difference in the looks and performance of our models. Often, a stock or one-size-fits-all muffler just won't do. What's a giant-scale guy to do? Enter Kelvin Cubbison, owner and operator of Keleo Creations. Kelvin offers hand-made custom exhaust systems for just about any engine you can think of! All the tube-bending is done with custom-made benders for precise forming, and Kelvin can build custom exhaust systems from rough drawings, blueprints and even grainy pictures sent via email. He can also build an exhaust system for you; just send him your engine and some rough dimensions of your installation and where you want the exhaust to exit. All of Keleo's exhaust systems are made of 6061-T6 aluminum alloy and are tig-welded to ensure a strong, long-lasting product. Each system is powder-coated with flat black for a

Continued on page 114

PLOTTING FORMER CROSS-SECTIONS



IN THE JANUARY 2005 ISSUE, I showed how you can use the top and side fuselage views to establish the vertical and horizontal reference lines to create formers for your model. But what if you don't have all the cross-sections you need to produce all the major formers? To wrap up our CAD plans discussion, you'll need to know the four basic steps to develop formers between two known cross-sections by plotting their shapes.

1 Place the two known cross-sections over each other so their vertical and horizontal reference lines coincide.

2 Draw a series of new reference lines between the known cross-sections as shown. I prefer to draw these lines perpendicular to the smaller cross-section, but it really doesn't matter. Divide each of these lines equally to produce the plotting points for the number of new cross-sections you want. In my illustration, I wanted two new cross-sections, so I divided each line into three equal lengths.

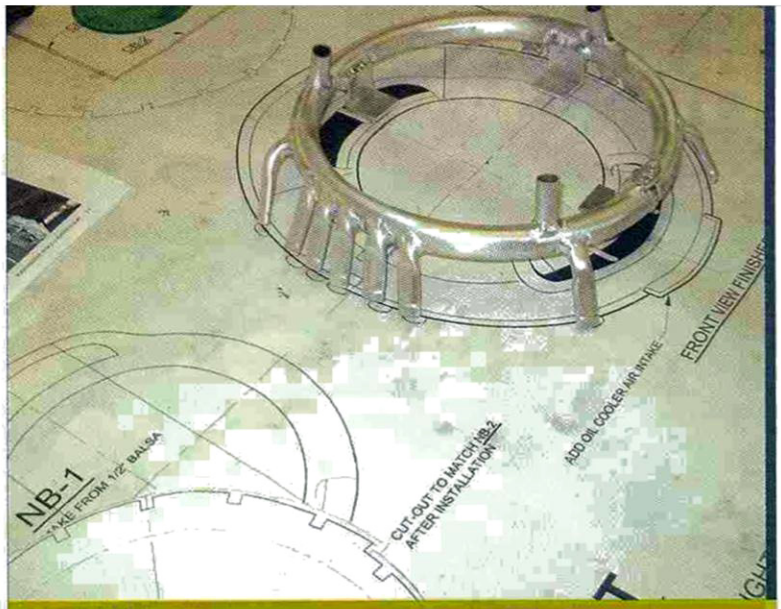
3 Use the curved spline-line tool and connect the plotting points, starting at the top vertical reference line. Click the start of the spline line about ½ inch horizontally from the first point, and then simply click the spline at each one of the plot points. Finish the spline as you began it by clicking the endpoint about ½ inch horizontally past the last plot point at the bottom vertical reference line.

4 Complete the cross-sections by deleting all of the reference lines as well as the ½-inch start and finish segments of the spline lines. Mirror-image the cross-section halves, and paste them into place to form the new full former cross-sections.

That's it! Now add the skin thickness and any stringer notches you require, and you're ready to cut balsa. Have fun using your CAD programs!

When some of the fuselage cross-sections aren't shown, you have to plot them using reference lines and the spline tool.

This rear-mounted collector ring ties all three of the Saito 170's exhaust pipes together for a scale-looking and efficient installation.



Here, a custom-built Keleo muffler is shown over the scale building plans it was built to match.

Continued from page 111

realistic, heat- and fuel-resistant finish. Kelvin offers exhausts for 4-strokes and big gas burners. Watch for a review in an upcoming issue. In the meantime, contact him at (503) 359-5318; keleo-creations.com.

CACTUS AVIATION HARDWARE

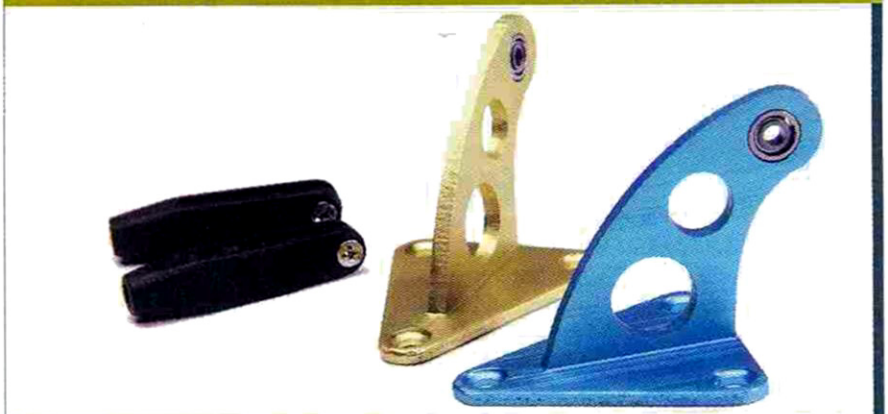
When you want to make your giant-scale model look good, it all boils down to the little details. Bobby Wilson, owner of Cactus Aviation, offers a way to prevent gas from running down your elbow when you fuel up your airplane! The 3W Fueler gas-cap fittings ($28.95 each) are made of highly polished machined aluminum and are way too nice to simply be called "fuel dots"! These miniature gas fittings come with countersunk attachment screws and a threaded mounting ring to hold them firmly in place. They have a screw-in cap with a rubber insert for a positive fuel-line seal. Available in combo packs, they include the filler and a T-fitting, so you can install them between the carb and the fuel tank for a simple two-line setup. For great looks and easy fueling, the 3W Fueler is the way to go!

Do you need reliable control horns for a really big airplane? Cactus Aviation's heavy-duty control horns are machined of aluminum and come in several anodized colors to match your plane's finish. Each features a pressed-in ball bearing at the clevis attachment point for smooth and accurate operation. The control horns come with a 4-40 threaded nylon clevis and an attachment bolt. A single horn costs $8.99, and a package of six horns is $50. Don't your control surfaces deserve the best? If so, contact Cactus Aviation at (520) 721-0087; cactusaviation.com.

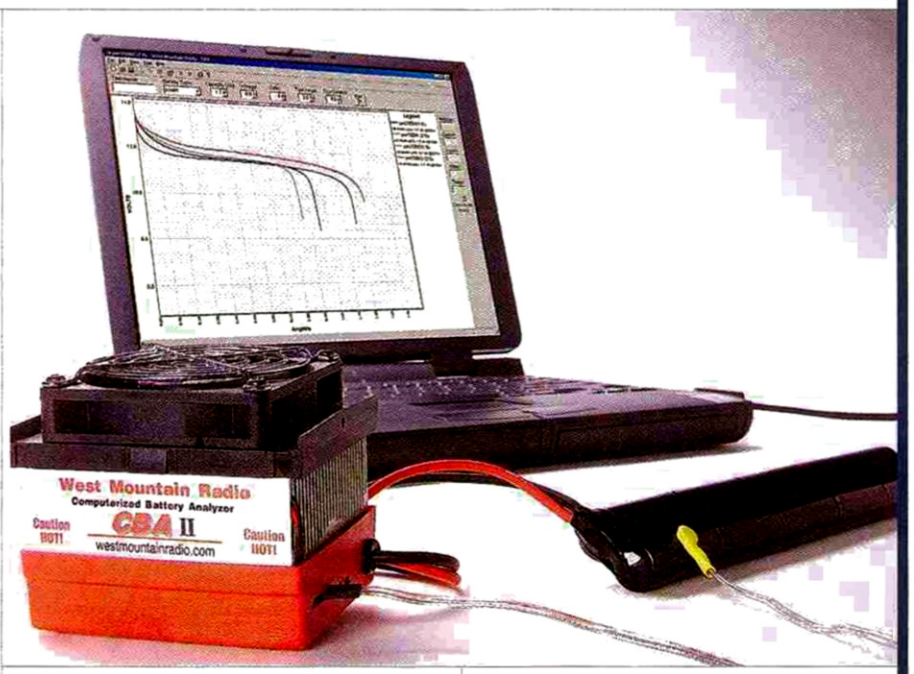
That's about it; if you have any questions, be sure to drop me a line at gerryy@airage.com.

A few custom items that Keleo Creations produced. Whether you have a single-, twin-, or 5-cylinder engine, Kelvin can build a muffler to your specifications.

From Cactus Aviation, this 3W Fueler gas-cap fitting combines convenience and good looks!



Big airplanes need strong control horns. Cactus Aviation has that covered with these machined, anodized-aluminum control horns. The 4-40 clevises with attachment screws are included.



>WEST MOUNTAIN RADIO
Computerized Battery Analyzer II
Taking the guesswork out of battery performance

The powerful Computerized Battery Analyzer II (CBA) quickly and easily tests a battery pack's or a single cell's performance characteristics. It can also test receiver and transmitter packs. The CBA can be used to test batteries of virtually any type, size and chemistry and can handle any number of cells up to 48 volts, 40 amps and 150 watts. The discharge current may be selected from zero to 40 amps (zero is useful to graph a charge-cycle voltage by putting the CBA across a battery while it's being charged).

To run the CBA, you need a computer that has Windows 98 or higher, a USB port, a screen resolution of at least 800x600 and 24MB of random-access memory.

The CBA not only tests the total amount of energy stored in a battery (capacity in amp-hours), but it also graphically displays and charts voltage versus amp-hours. You can display, save and print multiple graphs of one battery's parameters or of several batteries to compare them. I found this feature very useful. You can also print labels to put on your batteries, so you'll know when you last tested them and how they performed.

The package includes the CBA discharging unit with built-in cooling fan, a CD and a cord that plugs into a USB port on your computer. The 13-gauge battery cord has Sermos connectors attached to it. An optional temperature probe ($10.95) provides real-time temperature readings. The CD contains the software with the needed drivers and a comprehensive instruction manual; it is easy and intuitive to use. It automatically senses your pack's cell count and recommends the maximum safe discharge current and minimum safe cutoff voltage. I tested West Mountain Radio's new, upgraded version. If you have the first version, the company will upgrade it for $10.

To use the CBA, connect it to the USB port and open the program. The test parameters of the battery being checked are loaded into seven fields at the top of the screen. You can adjust every parameter.

To test the CBA, I used two 10-cell, 1700mAh NiMH packs that I have used for two seasons; both have seen extensive use and have performed well, but I felt that they were a little tired. Because they had sat for a few months, I first slow-charged them to their full capacity. I connected the first pack to the CBA. Because the pack produced more than 150 watts of power, I discharged it at a rate of only 8 amps. If I had tried to test it at 9 amps or more, a display would have indicated that the test would exceed the maximum 150 watts.

Connect the battery to the CBA, and the display shows the voltage of the pack at rest. Click the green arrow, and the test is under way. As the test progresses, all of the results are shown in real time on the auto-scaling graph. The data is shown as numbers in five fields. The fields turn a light shade of pink while the test is in progress and show the discharge voltage, current, watts produced, amp-hours and temperature (if the optional temp probe is being used).

As the discharge in amp-hours increases during the test, the amp-hour scale at the bottom screen self-adjusts. When the discharge voltage hits the assigned cutoff value, the onscreen data stops changing, and the test is complete. After running two tests of each pack, I opened the File drop-down menu and opened a "battery test curve." To view all of a pack's data on a single screen, use the "Overlay" function in the same menu. The tests are graphed in different colors, and a legend on the right of the screen identifies each test by the name it was saved under and the color that represents it.

When overlaid on the screen, the graphs were very revealing and showed that my packs were indeed underperforming. The graph showed that pack 1 produced slightly fewer than 1.2 amps and pack 2, less than 0.9 amp. Remember that both packs are rated at 1.7 amps and were tested at 8 amps! The second test showed that the packs increased only slightly in the amount of power they supplied; this proved that the packs were truly tired. I wish I had had the CBA when the packs were new; I could have established a baseline for them. By keeping records over time, you can determine a pack's useful life. If your packs have been idle for a while, the CBA is great for cycling them and graphing their performance so you can see how well they bounce back.

> "The West Mountain Radio CBA is a must-have for any modeler who is serious about battery performance.

The CBA can also help you to match cells, analyze packs for signs of fatigue, pick the best pack for an application, cycle and condition cells or packs and find the highest discharge current of a pack by testing it at a variety of loads.

The West Mountain Radio CBA is a must-have for any modeler who is serious about battery performance. It's versatile and very easy to use. At last, a device that allows you to track battery performance is available, and at only $99.95, it's very affordable. —*Rick Bell*

West Mountain Radio (203) 853-8080; westmountainradio.com.

Q-JET
Hobby-Rota VS
Complete workbench package

Looking for a great addition to your workbench? The Q-Jet Hobby-Rota VS variable-speed rotary tool comes with an AC to DC power converter and a six-compartment accessory box filled with cutting and grinding bits, cutoff discs, drill bits and a felt buffing bonnet. It also comes with its own clear-plastic carrying case. The chuck and lock pin make it very easy to replace cutting bits.

The VS version of the Hobby-Rota has an on/off switch and a speed-control knob, and it's outfitted with three ceramic grinding bits, two metal-cutting burr bits, a disc mandrel, a sanding drum, a metal grinder and a brass wire wheel. Several wafer cutoff discs, three twist drill bits and a small screwdriver are also included.

With an rpm range of 4,000 to 13,000, the Hobby-Rota is ideal for light- to medium-duty jobs. It costs $39.99. *—Gerry Yarrish*

Q-Jet; qjet.com.

SKS VIDEO PRODUCTIONS
"Warbirds over Delaware" DVD
Military modeling and much more!

Giant-scale, IMAA warbird events are very popular and draw attendees from far and wide. Each has its own flavor and style, but the granddaddy of them all is the Warbirds over Delaware fly-in at Lums Pond State Park in Newark, DE.

This DVD brings you an impressive, professionally edited view of all the great warbirds that participated in 2004. It includes several flying sequences augmented by interviews with pilots and highly detailed close-ups of the warbirds. Featured planes include Zach Spychalla's Ju-87, Sal Calvagna's S.E.5a, Kevin Shaw's Me-163 Komet, Joe Saitta's Me-262, Paul Tourneau's B-25 Mitchell and Carl Bachhuber's Avro Lancaster bomber and Boeing Stratocruiser. I enjoyed this 106-minute DVD very much and give it very high marks; for $19.95, it's a must-have for all warbird enthusiasts! *—Gerry Yarrish*

SKS Video Productions (800) 988-6488; sksvideos.com.

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. Manufacturers frequently send us their latest support equipment, and if we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

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BUSINESS

AG-AIRCRAFT PLANS. Pawnee, Agwagon, Pawnee Brave, *Transavia Airtruk/Skyfarmer, Fletcher FU-24, Cropmaster* and more. Hardware paks, colour photo paks, free documentation. Catalog/price list: $5 (U.S.); VISA/MC. New Zealand Aero Products, 34 Ward Parade, Stirling Point, Bluff, New Zealand. *Mobile:* +6427-427-1843. [5/05]

WANTED: UNIMAT AND WATCHMAKER LATHES; early microprocessors; KIMs; SYMs; AIMs; SOLs; robots and Atmos clocks. John Rawley, 1923 Susquehanna, Abington, PA 19001; (215) 884-9220; johnR750@aol.com. [6/05]

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QUARTER-SCALE FLEET MODEL 2 BIPLANE AND ⅛ ELECTRIC FLEET KITS. Concept Models, 6505 Urich Terrace, Madison, WI 53719. SASE for details; mailbag.com/users/conceptmodels; (608) 848-4108. [2/05]

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BOB'S AIRCRAFT DOCUMENTATION, NEW 2005/6. World's largest commercial collection of aircraft photos (400,000) and 3-view line drawings (39,000). 272-page catalog—$10; Canada, Mexico, Alaska, Hawaii & Puerto Rico—$12; international—$20 (includes air postage). 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058; bobsairdoc.com. [5/05]

R/C FLIGHT INSTRUCTION in North Central Georgia Mountains "Blairsville"; (706) 745-8667. [9/05]

JETS, JETS, JETS. Ducted-fan jet kits. Fly an F-15 Regal Eagle with a .61 engine; rcjets.com. [2/05]

COMPOSITE KITS TO REPLACE BROKEN ARFs—$15 TO $65. For catalog, send two stamps to Willairco, P.O. Box 57, East Palatka, FL 32131; (386) 546-3222. [2/05]

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HOBBYIST

FREESTYLE 45 looks great, lands gently and performs superior aerobatics. Photo in December issue's "Pilot Projects." Easier self-jigging construction, rolled AutoCAD drawings, detailed building guide and materials list plus bonus drawings; only $22.95 plus $6.95 S&H. Email LLCRCAERO@yahoo.com, or call (860) 739-6846 for full description and photos. [2/05]

FOR SALE: 35-year collection of model aircraft plans. Large, small, twin, singles, floatplanes, amphibians, flying boats, fighters and oddballs. Send SASE for a complete list and prices. W.G. Warner, P.O. Box 55, Gulliver, MI 49840. [1/05]

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BACK ISSUES, MODEL MAGAZINES. 61 Coach, Glastonbury, CT 06033-3237; davidbrown46@cox.net. [3/05]

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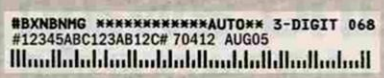

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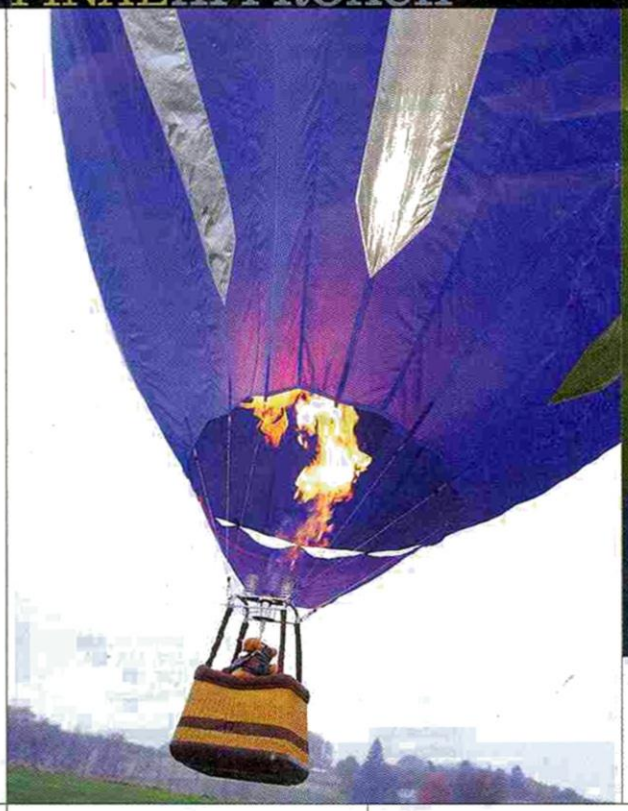
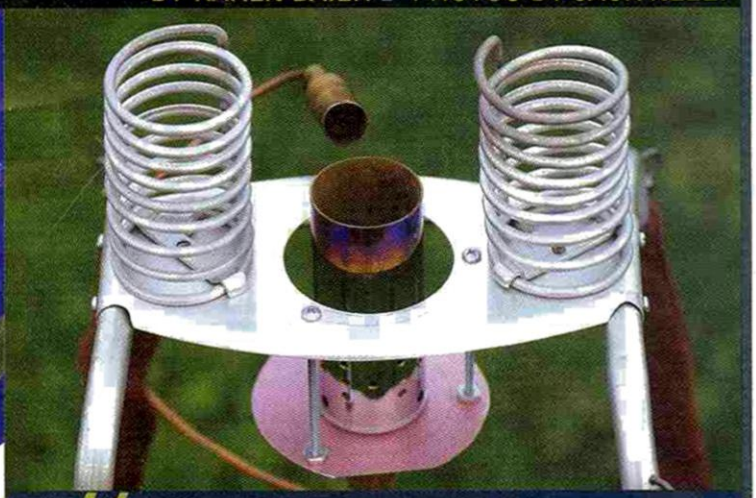
BY KAREN BAIER ▸ PHOTOS BY JACK NEELY

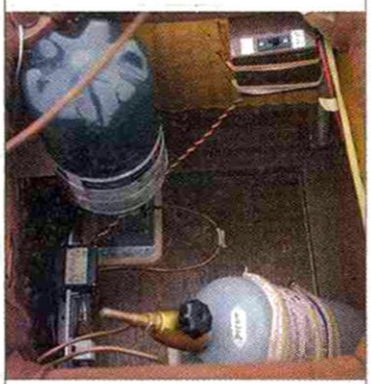




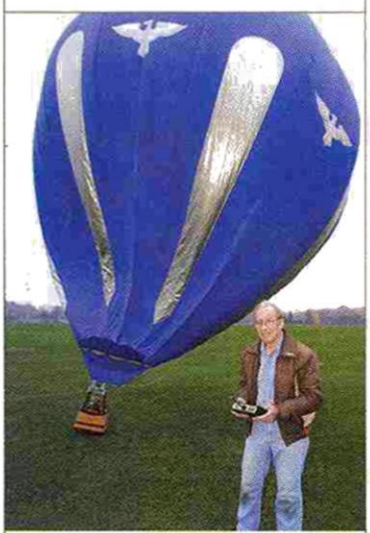
"... "It roars just like the real thing," Hilliard says cheerfully."

Up, up and away!

AN RC HOT-AIR BALLOON TAKES FLIGHT



The basket houses the propane and oxygen canisters and their plumbing.



Dave Hilliard poses with his masterpiece.

THE PLEASURE IS IN THE JOURNEY for Dave Hilliard. After working as a machinist and part-time drafter at a steel mill in Butler, PA, Hilliard—president of the Butler Area Radio Flying Society—fills a chunk of his retirement hours by blending his skills, tools and love of RC model airplanes to create one-of-a-kind flying machines.

"My big hobby is RC airplanes, but I like to draw them and build them more than fly them," he admits. His latest creation, though, is a 1/4-scale hot-air balloon. After seeing one fly at a festival in New York state, he was intrigued. Since there's nothing he likes better than developing a concept's specifications and drafting them into a hand-crafted finished product, Hilliard knew he would enjoy whatever came next.

By chance, he came to possess the rip-stop nylon material of the decommissioned "Silent Sea"—a full-size balloon that was 85 feet tall and 65 feet wide when fully inflated. He decided that he wanted his balloon to be 15 feet in diameter, and he used a photo of the original as a guide to its design. On the nylon, he measured equidistant horizontal segments from the bottom rim to the top along the perimeter. Arriving at a 22:1 ratio, he calculated the dimensions needed to create a balloon that would be 21 feet high and 15 feet wide, fully inflated. He drafted a pattern for the shaped vertical segments and cut 12 of them out of about 85 yards of fabric. The next step—sewing the pieces together—was time-consuming but not difficult. Hilliard used a regular sewing machine bolted to a worktable that he designed and built to support the nylon's weight, which increased as the balloon took shape. Turning his attention to the gondola (the basket that hangs beneath the balloon), Hilliard again used the photo as a guide to design a scale version. In his hands, twine and bamboo kabob skewers became basket-weaving materials.

Then it was time to concentrate on the mechanics of the project: heating the air. Working from the details of a full-size burner, Hilliard drafted and machined the parts he needed. "The air and gas mixture has to be just right. It took me a whole day of drilling holes to produce an almost invisible blue flame." Fueled by propane from a 2-pound, "short, squatty cylinder," his burner can produce a jet of fire that's 8 inches wide and 3 feet high. He controls the flame with his radio with only two positions—burner off and burner on—just like the controls in the full-size apparatus. One tank provides about a 12-minute flight. "It roars just like the real thing," Hilliard says cheerfully. From a weed-whacker, he salvaged a gasoline engine that powers the blower. Although the blower can fill the bag, cool air won't stand the balloon upright. Because he wanted to heat the air that enters the balloon in a different way, Hilliard devised a hand-held propane burner with a 3-foot-long wand and the same tip as the burner affixed to the basket.

At the flying field, Hilliard prepares his model by following the same steps as pilots of full-size balloons take. When the balloon is inflated, he switches to RC and ignites the burner to make it ascend. "It gets there in a hurry," he laughs. "If I didn't tether it, it would be in your view for about only 30 seconds." Instead of allowing the balloon to use all 150 feet of its tether, Hilliard prefers to maintain an altitude of about 10 to 20 feet so that spectators can see how it works. How often does Hilliard's crowd-pleasing balloon lift off? "Whenever someone wants to watch," he says with a grin. Judging by our enthusiastic response, that must be quite often!